VOL. XI. No. 7 JULY 1926

MECCANO MAGAZINE

THE WORLD'S LARGEST CONCRETE BRIDGE (See page 418)

6D

HOBBIES

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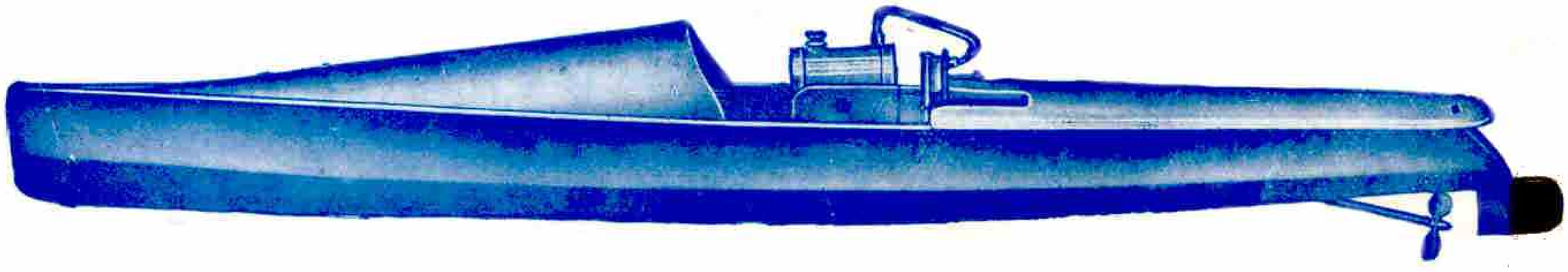

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MECCANO MAGAZINE

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With the Editor

Anniversary of a Great Battle

To-day, the 1st July, is the tenth anniversary of a great battle that was fought on the Somme. The battle was noteworthy because it was the first real attempt at an attack made by the allied forces, and also, sad to say, because of the particularly heavy losses that the British suffered on that occasion, both in killed and wounded.

Prior to the attack, the British artillery bombarded the German lines unceasingly for seven days and seven nights. This bombardment took place over a front of sixteen miles and the roar of our artillery was continuous and deafening. Only the British officers knew that it was timed to stop at 7.30 on the morning of the 1st July, and at that moment, after a week of continual firing, the range of the British guns was lengthened, and thousands of British troops went "over the top" charging across "no man's land" to attack the Germans. Of the many gallant deeds that were done in the next few hours this is not the place to speak—someday I may tell this story of British heroism in the "*M.M.*"

In spite of the heavy bombardment to which they had been subjected some enemy machine guns still remained undamaged, however, and these now came into action with deadly results. Thousands of British officers and men were killed and many thousands seriously injured. As a result, the great attack was checked and although we made some advance in a few places, this progress was effected only with heavy loss of life.

It is surprising how soon events of this kind are forgotten —except by those of us who participated in them—but in many homes, to which the 1st July brings only sad memories, the anniversary of the great battle will ever be remembered. Although many of my readers may, perhaps, have been too young to take an interest in the Battle of the Somme when it was fought, I think they may like to be reminded of it so that they may pay a silent tribute to the men who died for them ten years ago, "in Flanders fields where poppies grow."

Science in the Arctic Regions

A paragraph on this page last month dealt with the fact that Polar explorers of the future have the scope of their activities considerably widened, and the possibilities for useful work largely increased, by the introduction of the aeroplane and the airship. In our article on "Wireless at the Pole" this month we again have an illustration of the remarkable advance made possible by science in Arctic exploration, and we cannot help but feel that gradually science is working a great revolution in all directions.

Not only may it be possible at some future date, as a matter of interest, for explorers to broadcast from the Polar regions, but it may be practicable to use wireless even in such a remote and apparently commercially unprofitable area as the Arctic. This is made clear from a message that for the first time this summer the whaling ships in the Bering Sea will employ wirelessly-equipped seaplanes for "spotting" whales. Hitherto this has been done by look-out men in the crow's-nest, and at the fo'csle of the sailing ships, and their cry: "There she blows . . . ." has become known all over the world. It would seem that in future the message will be sent by wireless from the seaplane convoying the whalers, instead of being bellowed back to the wheel-house by a seaman.

Seaplanes have already been successfully used off Newfoundland for spotting seals on the ice, but this will be the first time that whales have been hunted from the air. Thus even the inaccessible Arctic is not immune from the introduction of advanced scientific methods—when they can be employed on a commercial basis and made to "show a profit."

"Naming the Air-liners"—New Closing Date

As was announced last month, arrangements have been made with the De Havilland Aircraft Co. Ltd. for a series of free flights for "*M.M.*" readers in the famous "Moth" aeroplanes. These flights will be awarded as prizes in connection with a competition, the rules of which are as simple as I can make them with the object of giving every reader an equal chance of winning one of the much coveted flights. A 50-mile "out-and-home" flight, in any direction to be chosen by the winner, is the First Prize, and full particulars of the contest, and of the other prizes, will be found on page 426.

Apart from the pleasure that will be given to the prize-winners in thus having an opportunity of making a flight in a "Moth" aeroplane, it is an honour that readers of the "*M.M.*" should have been invited by the De Havilland Co. to name the new air-liners. That they fully appreciate this honour I have not the slightest doubt.

Owing to the possibility of this issue not being in the hands of all readers on the morning of the 1st July (see paragraph below) it has been arranged to extend the closing date (originally announced as 5th July) to the 12th July. I hope that all readers who have not already done so will send in their entries in good time, and I expect to be able to announce the result in our August or September issue.

Publication of the "M.M."

In common with all other publications, the "*M.M.*" is at present being published under the many disadvantages and difficulties arising out of the coal strike. Not only is the supply of electrical power curtailed, thus making it difficult to print the magazine, but there are inevitable delays in distribution, principally due to the fact that the railways are not running a normal service. There are many other difficulties that also have to be contended with, but I want to take this opportunity of assuring my readers that everything possible is being done to get the magazine to them by the usual publication date, which is the 1st of the month. Even so, the magazine may be a day or two late in some cases—a regrettable state of things that may continue until this unfortunate strike is settled and normal circumstances again prevail.

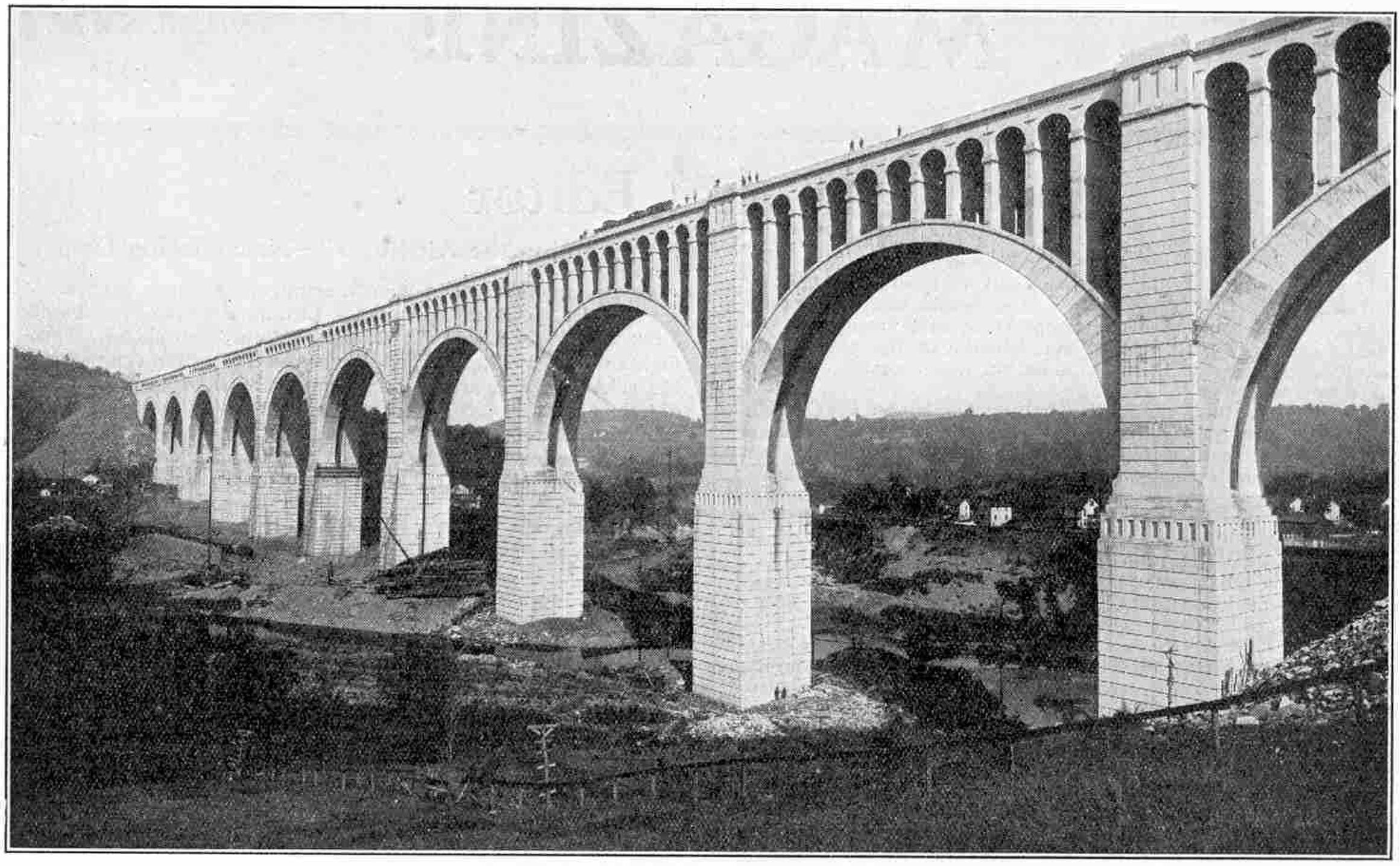
I much appreciate the interest that readers display in the "*M.M.*," and their eagerness to have their copies at the earliest possible moment is only natural. I would remind those who have written to me during the past few weeks—pointing out that they were not able to obtain the June magazine first thing on the morning of publication date—of the above-mentioned difficulties under which everyone is working at the present time. I would ask readers to bear with us in these difficult times, to exercise a little patience, and not to blame unduly their dealers or newsagents if they cannot fill their requirements on the morning of publication date.

As I mentioned last month, some new readers apparently continue to experience difficulty in obtaining the "*M.M.*" through their newsagents. There should be no difficulty whatever about this, and if at any time your newsagent cannot obtain supplies from his wholesaler ask him to write to me, and I will arrange to supply him direct.

In any case, the Magazine is stocked by all Meccano dealers and there is at least one Meccano dealer in every town, so there should be no difficulty whatever in obtaining the "*M.M.*" regularly.

World's Largest Concrete Bridges:

Two Mammoth Viaducts for American Railway



Tunkhannock Viaduct, the largest concrete bridge in the world

OUR cover this month shows the Tunkhannock Viaduct, a colossal structure situated near the little town of Nicholson, Pasedena, in the United States. The viaduct carries the double tracks of the main line of the Lackawanna Railroad, from mountain to mountain across the valley of Tunkhannock Creek.

The Viaduct, constructed entirely of reinforced concrete, contains approximately 167,000 cubic yards of concrete and 2,280,000lbs. of reinforced steel. It consists of 10 spans of 180 ft. each, and two spans of 100 ft. each, which are surmounted by small superimposed arches, upon which the solid concrete surface of the viaduct and the railway track is carried.

Concrete has been in use for building construction from the time of the Romans. The defect of simple concrete is that it behaves poorly under bending stresses, but in recent years this has been remedied by embedding steel bars in the concrete. The resulting material, Ferro-concrete, may be regarded as the building material of the future.

Railway Track 240 ft. above River

The viaduct, which is situated 22 miles west of Scranton and 40 miles east of Binghampton, is easily the largest concrete bridge in the world. It is 2,375 ft. in length and towers 240 ft. above the river below, its height from bed rock being 300 ft.

Some idea of these immense proportions may be obtained by comparing the height of the Viaduct with the Forth Bridge, the former being nearly 100 ft. higher than the level at which the railway line is carried across the Forth.

The foundations have been carried down to solid rock and to make this possible two of the piers required an excavation of 95 ft. in depth from the ground surface. The excavation for the foundations of other piers had to be carried through sand, gravel and boulders to a depth of 60 ft. below the water level.

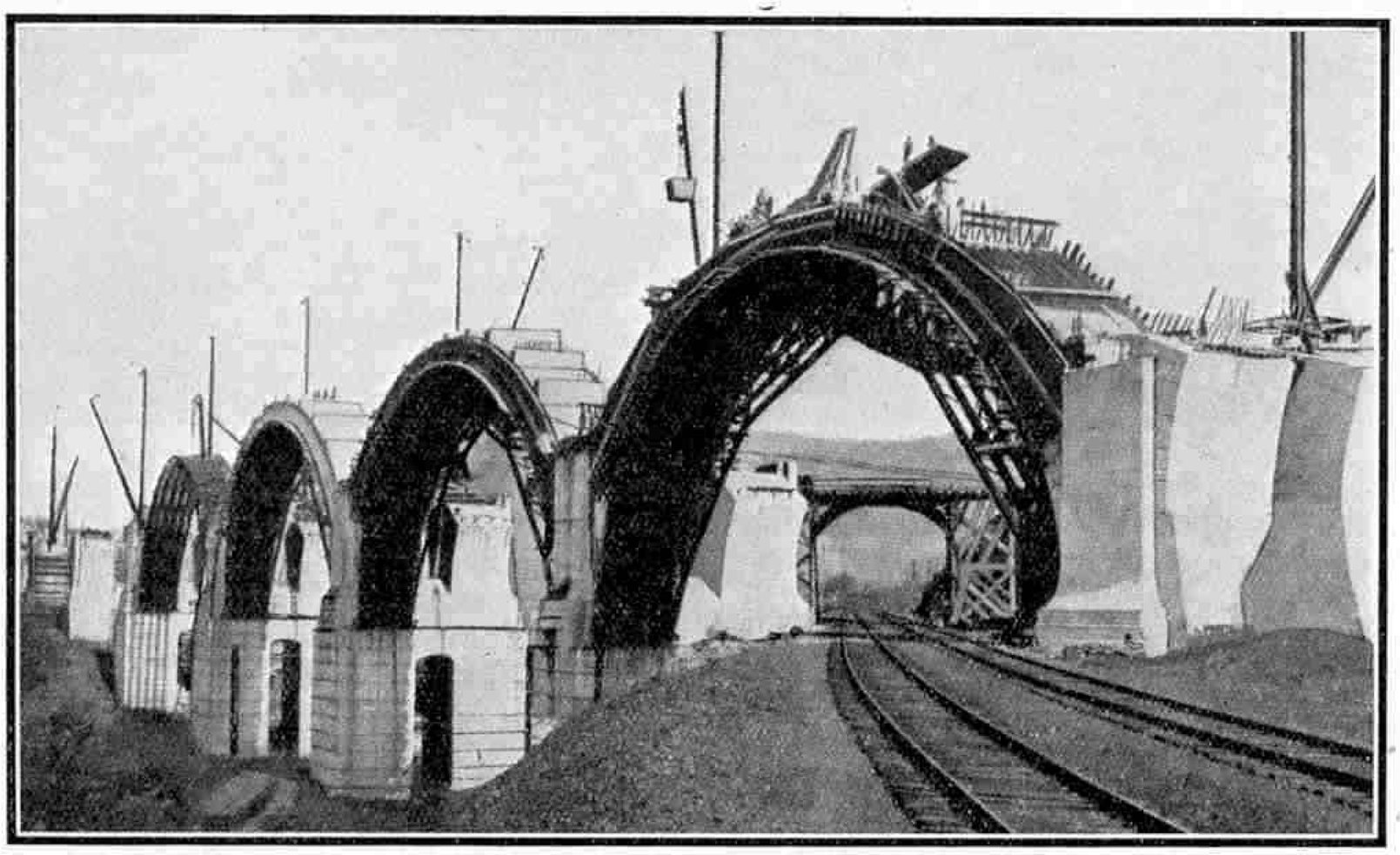
Martin's Creek Viaduct

Just west of the Tunkhannock Viaduct is Martin's Creek Valley. Here the new railway line runs to the east of the old line, which it crosses by means of Martin's Creek Viaduct, about a mile east of Kingsley and nine miles west of Nicholson, at which latter point is located the Tunkhannock Viaduct.

Martin's Creek Viaduct, although not so large as the

Tunkhannock, is of imposing dimensions being 150 ft. above the bed of the creek, and 88 ft. above the level of the old line. This viaduct has a total length overall of 1,600 ft. and consists of 11 spans—seven of 150 ft., two of 100 ft. and two of 50 ft. Over 77,500 cubic yards of concrete and 1,600,000 lbs. of reinforced steel were used in its construction.

Although less than half the size of the Tunkhannock Viaduct, Martin's Creek Viaduct is itself, with the single exception of the Tunkhannock Viaduct, the largest concrete viaduct in the world.



Martin's Creek Viaduct under construction

Viaducts will give improved running

These mammoth viaducts are but two links in a great scheme, known as a chain of alignment, that has so greatly improved operating conditions on the Lackawanna Railway as to fully justify the expenditure of the £3,000,000 involved.

The economies effected will result chiefly from the elimination of the former heavy grades and curves. The maximum gradient on the old line was 1.23% whereas on the new line it is but 68%. The total curvature was 3,970° but with the improvements now introduced it amounts to only 1,576°.

As to what this means in a practical way—it may be said that on the new method of working a heavy freight train, which formerly required five engines, is now moved at the same rate of speed by only two. This, and the shortening of the distance by 3.6 miles, also permits of shortening the time of fast passenger trains by as much as twenty to thirty minutes.

Some idea of the magnitude of the operations necessary to make possible the construction of the new line is gained when it is stated that the amount of earth moved will reach a total of 5,525,000 cubic yards, while the rock excavation has reached a total of 7,647,000 cubic yards.

Over 300,000 cubic yards of concrete has been used, while the amount of reinforced steel employed in the construction of the various bridges, viaducts, and culverts amounts to 4,720,000 lbs.

Incidentally it will be of interest to mention that the Lackawanna Railroad was one of the pioneers of wireless telegraphy and telephony between fixed stations and trains in motion.

The experiments commenced as far back as 1913 and in November of that year a Lackawanna "Limited" left Hoboken (New Jersey) terminus completely equipped for transmitting and receiving wireless telegraphic messages during its journey.

Four fixed stations equipped with lofty aerial towers—those of Hoboken are 402 ft.—and powerful sets covered the 400-mile run from Hoboken to Buffalo. Scranton, the second of the four stations, is 130 miles from Hoboken, and Binghampton, the third station, 62 miles west of Scranton. The initial run proved that before a train passed out of one station the station ahead could be picked up, so that the trains were in constant touch with the stations. The wavelengths of Hoboken and Scranton are 3,000 metres, Binghampton 1,800 metres and Buffalo 1,600 metres.

Special Aerials necessary

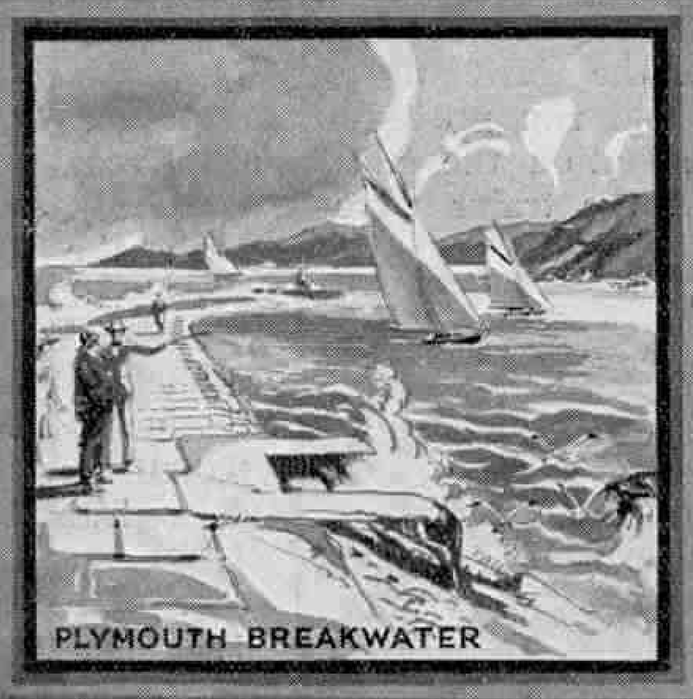
Bridges and tunnels render necessary specially low aerials on the trains, and they consist of phosphor bronze wire strung around the coaches, about 18 in. above the roof. The wire rectangles are supported at the corners by porcelain insulators so fitted that the aerial can easily be removed complete. A third wire, also suitably raised, passes along the centre of the car roof. The aerial units of the coaches are joined together by a length of slack wire. From the central coach unit a lead is taken to a small operating room at the end of one of the coaches. This interesting compartment measures only 2 ft. by 4 ft. The earth wire is led to the track by connection to one of the bogie trucks of the car and the current is derived from the dynamos that supply the train with electric light.

Messages Received at 70 Miles an Hour

Messages have been transmitted and received when the train has been speeding along at 70 miles an hour and distances up to 130 miles—the first lap of the Hoboken-Buffalo run—successfully covered.

The value of the apparatus has been demonstrated in different ways. During a violent storm within six months of the adoption by the Company of wireless, telephone and telegraph wires were brought down over an area of several hundred square miles, and complete disorganisation reigned everywhere for ten days, except on the Lackawanna system. While poles, wires and signals were being repaired, the Lackawanna carried on by wireless between their stations and their trains, and this practical demonstration prompted other companies to prepare similarly for the next great storm.

On another occasion a passenger was suddenly taken ill, and was diagnosed by a doctor on the train as being an urgent hospital case. The station ahead was called by wireless and the matter reported. When the train pulled up at the station some time later an ambulance was waiting and the patient was hurried to the operating theatre. The operation was successful, and it is extremely probable that the passenger owed his life to the time thus saved.



Lives of Famous Engineers

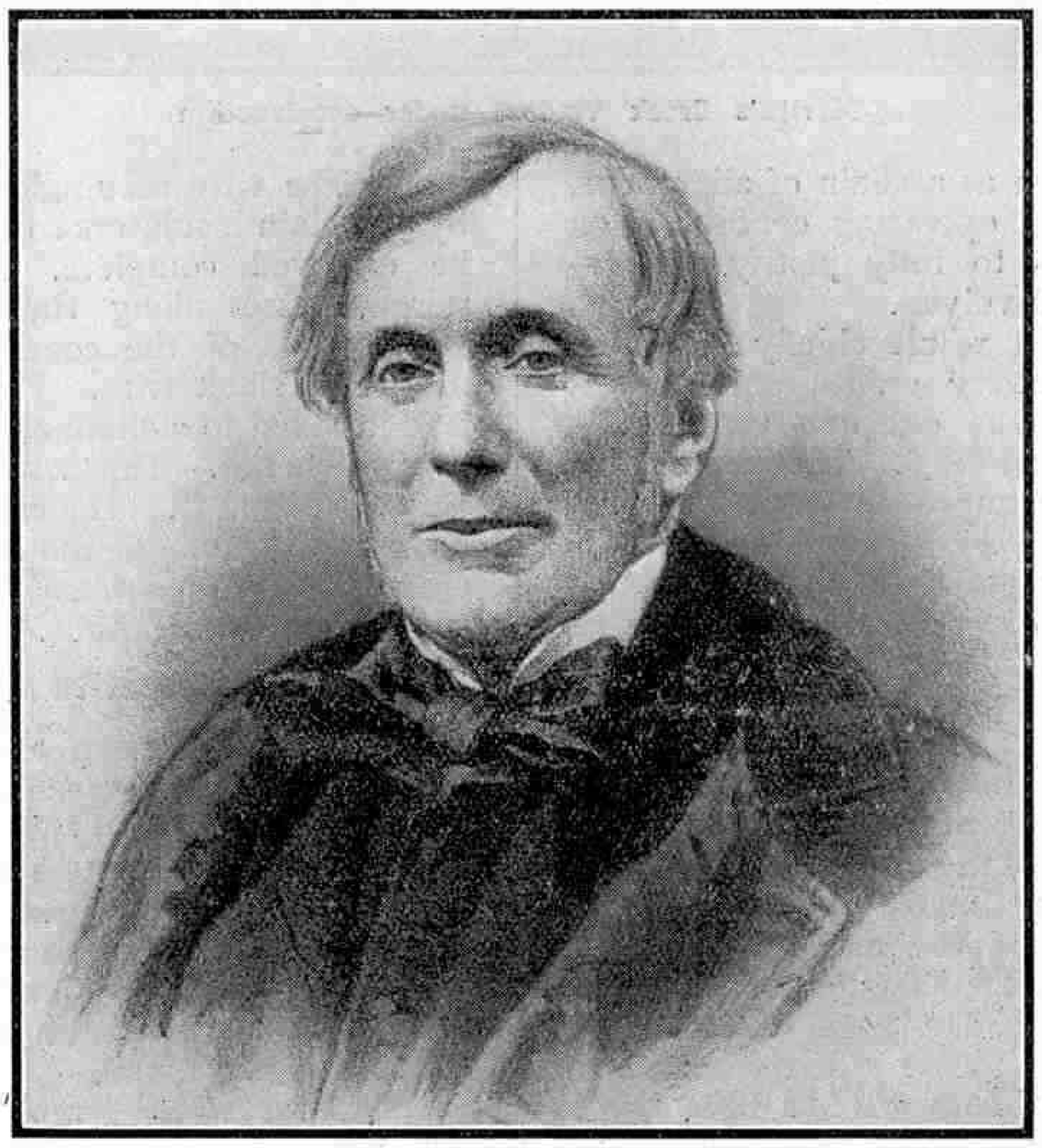
XXX SIR JOHN RENNIE BRIDGES AND HARBOURS

IN this series of articles we have already had two remarkable instances of father and son achieving distinction as engineers, namely, the two Stephensons and the two Brunels. We now come to a third instance of inherited engineering ability in Sir John Rennie, son of the John Rennie of Waterloo Bridge fame, whose career we have described in our last three issues.

At School with Shelley

Sir John Rennie was born in London on 30th August, 1794, and in due course began his education at a school at Isleworth, and it is interesting to note that among his schoolmates was Percy Bysshe Shelley, the poet. During the later years of Rennie's schooling the main topics of conversation were the great deeds of Wellington and Nelson, and not unnaturally the boy became fired with a desire to join the Army. This ambition was never realised, however, for his father was determined that the boy should follow him in the engineering profession.

On leaving school, Rennie was installed in his father's workshop, where he served periods at sawing and planing, pattern-making, wood-turning, and metal-turning, remaining in each department until he had become a reasonably good judge of such workmanship. A term in the drawing office followed, supplemented by various technical studies.



Sir John Rennie, F.R.S.

First Appointments

Having received a thorough grounding in the rudiments of his profession, Rennie began practical work as understudy to the resident engineer to the Waterloo Bridge scheme, and shortly afterwards was employed by his father in a similar position in connection with the construction of Vauxhall Bridge. These posts gave him little opportunity of showing his great ability, however, and it was not until he became associated with the Southwark Bridge scheme that his chance came.

Rennie assisted his father in drawing up the plans for the Southwark Bridge, and later was given the task of carrying out some of the more important details of these plans.

The scheme called for blocks of stone for the key positions and pier abutments of larger dimensions and weight than hitherto had been used in London for such work. The contractors declared that such huge blocks could not be quarried and conveyed to London, and at first refused their help.

Rennie Surprises Peterhead

Rennie was despatched to the Aberdeen district, and near Peterhead he located large masses of red granite close to the main turnpike road, which closely followed the coast-line. Engaging a number of workmen, who at first were very sceptical about the job, Rennie successfully dislodged by the aid of wedges a huge block of granite weighing about 25 tons. This block was then slid down to the roadway on a wooden platform carried upon crude wooden rollers.

The difficulty of getting the stone into Peterhead, four miles distant, Rennie overcame by securing together two single bogies, each with strong wheels 8 ft. in diameter, and having a strong axle shaft and a double pair of shafts in front. After successfully slinging the stone by strong chains to the two longitudinal bearers of the rough carriage, Rennie had a dozen horses attached to the front, and the huge stone began its journey. The whole town turned out to see the unique procession, and greeted it with considerable enthusiasm.

Nervous Skippers

The great stone was safely conveyed to the quay, but there another difficulty arose. The captains of the available vessels refused to undertake the shipment of the stone to London on the ground that it would crash through the bottom and sink the vessel with all on board! After a great deal of trouble Rennie managed to persuade a skipper to undertake the task, and commenced operations by strengthening the hold of the ship as a precautionary measure. The only quay crane was utterly inadequate to lift the stone on board, but Rennie was equal to the occasion. He rigged up two sets of strong sheerlegs and by means of these, assisted by the quay crane, the stone was safely hoisted on board. The operations were watched with the keenest interest by almost all the local inhabitants and when the task was successfully accomplished the workmen were feasted royally, the town devoting the remainder of the day to festivities.

Modern machinery has rendered such an operation as this of small significance, but Peterhead will always remember Rennie and his big stone, which marked the beginning of quarrying on a new scale.

Death of his Father

After the completion of the Southwark bridge, in 1819, Rennie went on an extensive European tour, to study past and present architecture and engineering as applicable to his work. On his return to England in September, 1821, he found his father seriously ill, and less than a week later the old man died.

Rennie was appointed by the Admiralty to succeed his father as their engineer, and in December 1821 he succeeded him also as chief engineer to Ramsgate Harbour. The harbour was then in great need of repair, and in the following year a collapse of the dock walls necessitated the rebuilding of the entire structure, the foundation being taken deeper than previously.

Another responsible undertaking that Rennie took over was the completion of the Plymouth Breakwater. Following upon the partial collapse of the wall when, as we described last month, the sea altered the angle of slope on the seaward side from a ratio of 3 to 1 to about 5 to 1, Rennie was called in by the Government. The recommendations he subsequently made were strongly opposed by the superintendent of the breakwater, who previously had over-ruled the views of John Rennie as to the angle of slope that would render the walls most resistant to the sea. The Admiralty finally accepted Rennie's report and advice, however, and appointed him chief engineer. The work was carried out to his ideas and proved completely successful.

New London Bridge

Perhaps the most important work that Rennie took in hand on the death of his father was the construction of the new London Bridge. The design of the bridge was thrown open to competition, but although numerous designs were submitted by eminent architects and engineers, the one put forward by John Rennie carried the day, and he was instructed to prepare working drawings and an estimate. His premature death placed these tasks in the hands of his son, who was later successful in securing the appointment of engineer-in-chief.

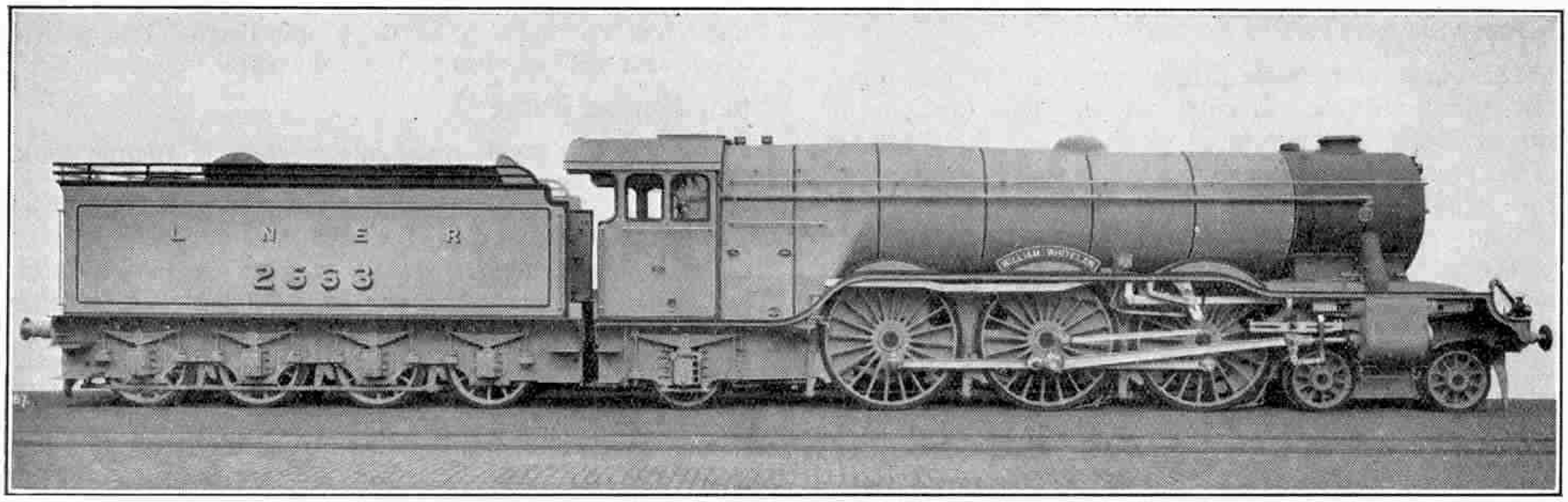
London Bridge as it is To-day

The Corporation of London had not shared his father's desire to first demolish the existing bridge and erect a temporary wooden one above it for use while the new bridge was built up underneath, and they were at great pains to discourage Rennie from following this course. Finally he gave way to them, and agreed to construct the new bridge as near as practicable to the old one, on the upper reach of the river. It is interesting to note that if the proposal of the two Rennies had been agreed to, considerable economy would have been achieved in respect of cost, labour and risk.

At the point where the old bridge piers were founded, the bed of the river formed a hill, falling away each side from 28 to 30 ft. The strong flow during both the flood and ebb, occasioned by the great fall and scour through the contracted waterway of the old bridge, had necessitated the securing of the piers by large projecting "starlings" (rings of piles supporting the piers), and the frequent throwing in of considerable quantities of stone around them, to prevent the old structure from being washed away. The insistence of the Corporation on having a fresh site for the new bridge deprived Rennie of the advantage of a 5 ft. reduction in the depth of water that would have resulted from the removal of the stone piers of the old bridge. Instead, he had to construct cofferdams and foundations at a greatly increased depth, away from the submerged hill under the old bridge, and he was hampered in addition by the increased current.

A Serious Accident

The masonry of the piers was built up upon an elaborate system of piles penetrating 30 ft. below the river bed. While examining the work of the first pier on the Surrey side Rennie met with an unfortunate accident which might have proved fatal. Describing the affair in his autobiography, Rennie says:—



A Splendid L.N.E.R. "Pacific"

Our illustration shows L.N.E.R. No. 2563, "*William Whitelaw,*" a 4–6–2 three-cylinder express passenger engine of the "Pacific" type. This type of loco is largely used for hauling the principal expresses on the L.N.E.R. between London, Edinburgh, Glasgow and Aberdeen.

No. 2563 was built by the North British Locomotive Co., of Glasgow, in 1924, to the design of Mr. H. N. Gresley, and it is fitted with his patent valve gear. Its cylinders are 20 in. in diameter and the stroke is 26 in. The driving wheels are 6 ft. 8 in. in diameter and the boiler barrel 6 ft. 5 in. diameter by 19 ft. in length.

The grate area is 41.25 sq. ft., and the heating surface 3,455 sq. ft., including the "Robinson" superheater with which the loco is fitted. The boiler pressure is 180 lb. per square inch and the loco exerts a tractive effort of 29,835 lb. The total weight of loco and tender in working order is 148 tons 15 cwt.

"After this pier had advanced nearly to the level of high water, one day whilst examining it, standing upon one of the cross beams, my foot slipped, and I fell headlong into the dam upon the top of the masonry; fortunately, my left foot caught in a nail in the beam, and I hung by it for a few seconds. This somewhat broke and changed the direction of my fall, and I pitched upon an inclined plank, upon which I slid until I struck my head upon a stone; my hat deadened the blow; as it was, however, I was cut about the forehead and half stunned. The after effects of this fall were very serious; my whole system got such a severe shaking, that I did not recover thoroughly until nearly ten years afterwards, and I carried on my large professional business with the greatest difficulty."

New London Bridge consists of five semi-elliptical arches, the centre one having a span of 150 ft., the next two spans of 140 ft. each, and the two side or land arches spans of 130 ft. each. The two centre piers are 24 ft. thick at the springing, and the two side piers 22 ft. each. The exterior masonry of the bridge is of whitish-grey granite, and the interior of hard Yorkshire gritstone from the quarries of Bramley Fall. The original width of the bridge was 54 ft., but in 1902-5 this was increased by Sir Benjamin Baker to 65 ft. The increase was effected by means of cantilever brackets, and at the same time the original solid parapet was replaced by one of a lighter type.

Completion of the Bridge

The framing of the various "centres" necessary in setting the masonry of the respective arches had to be done in a special workshop provided by the contractors at Millwall, in the Isle of Dogs. The centres consisted of eight main ribs framed upon the truss principle. They were launched in one piece from a specially prepared platform and towed to the Southwark end of the bridge, where a lighter, fully equipped with powerful tackle, received them. Each centre was carefully hauled to a vertical position on the lighter and raised high enough to give 2 ft. clearance at the point where it was to be lowered. By taking advantage of the tide when on the ebb, the centres were lowered into position and secured with the maximum of care and deliberation.

The bridge was completed in due course and was formally opened by King William on 1st August 1831. His Majesty journeyed to and from the bridge by the Royal Barge, and the occasion was regarded as a general holiday. In appreciation of his excellent work in connection with the bridge, the King conferred upon Rennie the honour of knighthood.

The removal of the old bridge was completed in 1834, when the river was restored to its natural state after a lapse of 658 years. The story of the old bridge is one of extraordinary interest and we hope to tell it in a future issue.

After the completion of work in connection with the London Bridge, Rennie set out on a European tour during which he paid a prolonged visit to Russia and was specially interested in the Baltic ports and naval bases. Subsequently he designed, at the request of the Emperor Nicholas, a complete naval establishment for Cronstadt. He also visited Spain where he had many opportunities of viewing at first hand the results of the Carlist War, and also experienced the attentions of brigands, happily without serious results.

A Meeting with Telford

A good deal of Rennie's time was occupied in planning and executing various drainage schemes in the Fen district. On one of these schemes he was appointed joint engineer with Telford, the famous engineer of the Menai Suspension Bridge, whose career we dealt with in the "*M.M.*" for November and December 1924 and January 1925. In his autobiography Rennie describes how, on one occasion, he and Telford were examining the state of certain channels on a wild and stormy day. Ultimately the weather became so bad that they were driven back to the local inn.

"We got back," says Rennie, "thoroughly soaked, about three in the afternoon. I immediately stripped and went to bed. Old Telford, being a strong, hearty man of about 70, instead of following my example, ordered a large fire to be made in the only sitting-room there was, called for the newspaper and set himself down to dry. After two hours' nap I was thoroughly refreshed and went down to the sitting-room. When I entered there was such a steam that I could hardly see anything, but approaching the fire found Telford had nearly dried himself, and he abused me thoroughly for being so effeminate as to go to bed!"

Telford afterwards suffered from internal trouble as the result of this foolish conduct but the episode gives us a typical example of the old man's obstinacy and determination.

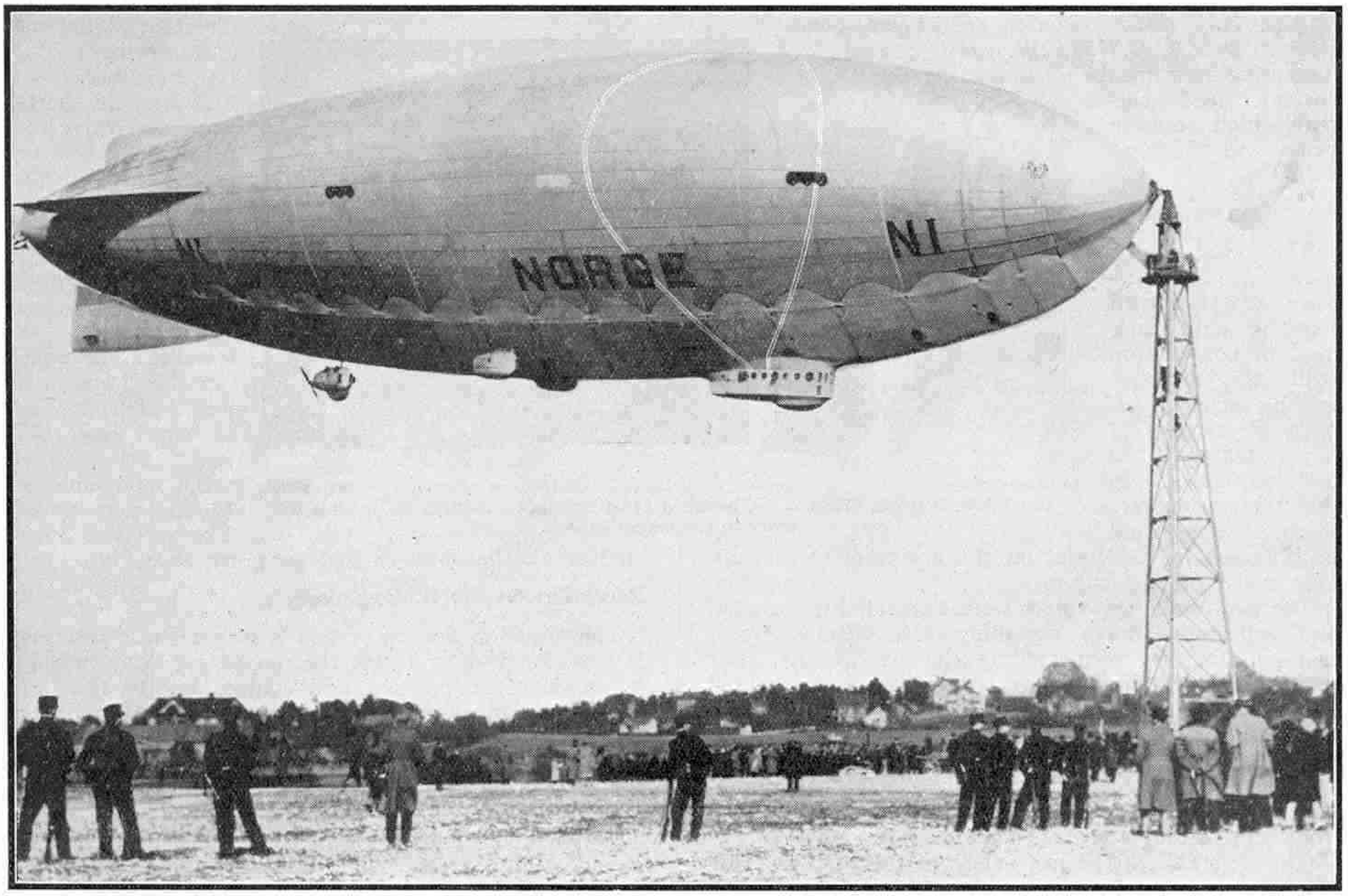
During the railway mania of 1844, Rennie handled many of the schemes for new railways. The demand at that time for engineering surveyors was extraordinary. Rennie was overwhelmed with work and for several weeks toiled day and night preparing plans for Parliament. It is said that at this time he employed over 300 assistants in various capacities.

A large share of the credit of introducing into the Royal Navy the method of propelling steam vessels by screws must be given to Rennie, and he was very proud of his achievement in this direction.

Rennie's active career as an engineer came to a close about 1866, when his shaken health made complete rest necessary. He occupied himself subsequently in literary work and, in addition to his autobiography, he wrote an account of Plymouth breakwater, and a work on the theory and practice of harbour construction. He died in September 1874 at the age of 80.

Wireless at the Pole

Equipment of Amundsen's Airship "*Norge*"



The "*Norge*," showing the direction-finding aerials in position

IN our special article on "Polar Exploration by Air" last month we dealt with early attempts to reach the pole by air and also mentioned the latest achievement in this direction—the successful flight across the polar regions, and over the Pole itself, by Amundsen in the "*Norge*."

Not only is this the first time that an airship has been employed successfully by a polar expedition, but the flight also marks a notable milestone in history by virtue of the fact that whilst in the Arctic the expedition was able to communicate with the world by means of wireless.

A Vision of the Future: Speed and Television from the Pole

In the past it has generally been accepted that in polar exploration the intrepid adventurers must cut themselves off from the outer world for long periods, and that they must remain in complete isolation in the regions of eternal ice until their work is accomplished.

Modern science has changed all this, however, and now the polar explorer is not only able to learn the news of the day by means of his wireless receiver, but is also able to inform the world of his position and progress. Giving rein to our imagination, we may look into the future and think of the time when the explorer, standing at the Pole itself, may be able to speak by wireless simultaneously to audiences in the four continents. He may thus describe his adventures whilst on the screen are shown, by means of television the scene at the Pole—the camp, the sledges, or perhaps a seal hunt, or a fight with giant polar bears! That such an achievement will be well within the bounds of possibility in the not-distant future is quite certain.

The Transmitting Apparatus of the "Norge"

In the meantime the first step in this direction was taken when the "*Norge*," equipped with a special Marconi Wireless receiver and transmitter, sent Morse messages from the Polar regions. As the normal range of the transmitter and receiver was designed for up to 2,000 miles the "*Norge*" was able to keep in touch with either ship or land stations up to very considerable distances, the equipment being designed to enable the air

ship to maintain communication with the outside world throughout its entire voyage through Arctic solitudes.

The transmitter was an adaptation of the Marconi 0·5 kw. Type U set, and was suitable both for continuous wave and tonic train signalling. In order to meet the special conditions obtaining in the airship, and to utilise to the best advantage the extremely limited space available, the principal components were mounted on a light teak baseboard.

These components comprised :—Two Type T 250 Valves, H.F. choke, reaction condensers, Send-Receive switch, C.W.-I.C.W. switch ; and measuring instruments for indicating aerial current, feed current, high tension volts and filament volts.

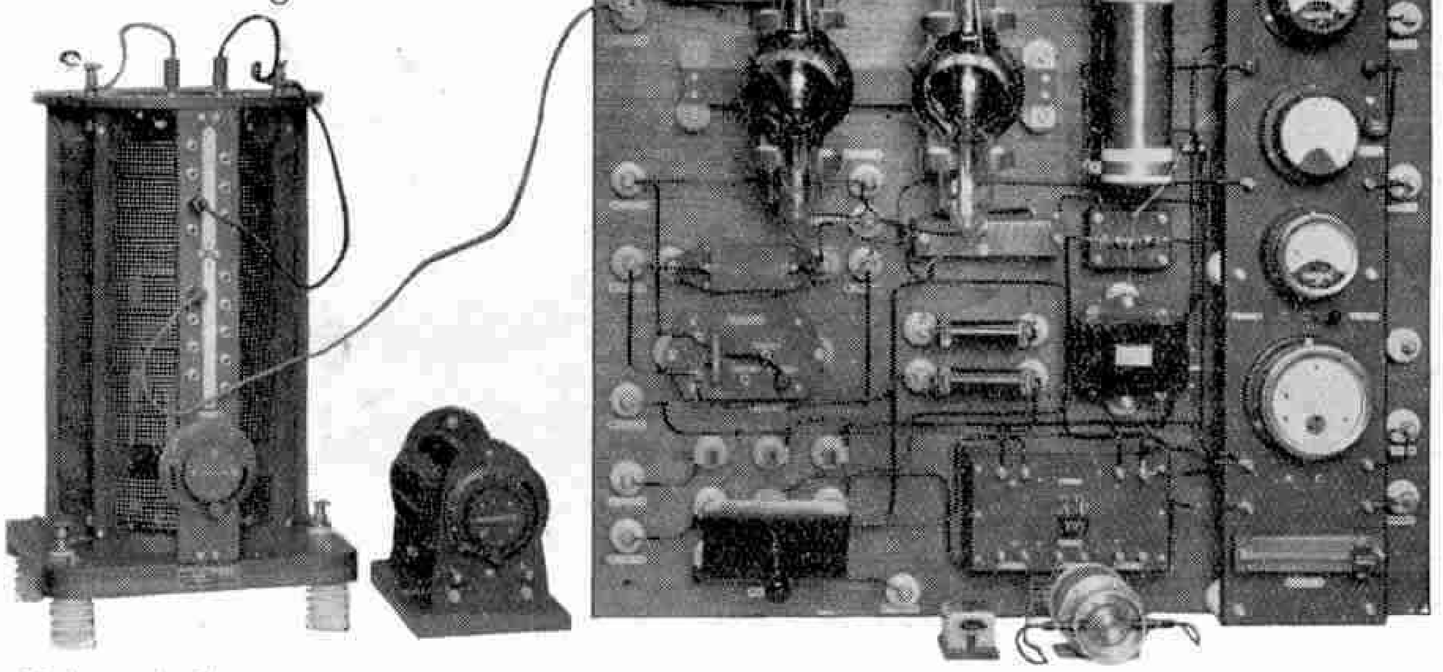


Photo courtesy] [*Marconi's Wireless Telegraph Co. Ltd.*

The 3 k.w. Marconi Transmitter, installed in as compact a manner as possible in order to economise space

Air-driven Generator

The aerial tuning inductance and variometer formed separate units and, used in conjunction with the airship's trailing aerial, covered a wave-range of approximately 550 to 1,500 metres. On the transmitter six to seven amps could be obtained in the aerial on the optimum waves and four to five on the extremes.

The two oscillating valves were connected in parallel, and continuous wave signalling was effected by a manipulating key connected in the grid circuit. For tonic train signalling the grid circuit was interrupted by a small rotary interrupter.

Power for the anode circuits of the transmitting valves, and for charging the filament lighting batteries, was derived from a combined H.T. and L.T. direct-current generator developing 133 millamperes at 3,000 volts and 14 amperes at 14 volts.

The generator, fitted just astern of the wireless cabin on a locker, was driven by an air-screw fixed about 5 ft. from the side of the gondola. The propeller had a right-angled bevel drive, but the angle at which the propeller faced the air stream could be varied from inside the cabin by a special lever. This lever could be adjusted and locked to suit the speed at which the ship was travelling, or the rate required by the dynamo. The propeller was of the four-bladed type and capable of developing about three horse-power.

The Trailing Aerial, 300 ft. in Length

For emergency purposes a horizontally-opposed twin cylinder petrol engine of $2\frac{3}{4}$ h.p. was mounted on a lightly-constructed tubular steel framework, capable of being quickly fixed outside the gondola and to this framework the generator could be quickly attached by means of wing nuts.

A switchboard fitted with an automatic cut-out, ammetor, voltmeter and " W/T-Charge " change-over switch enabled the low tension batteries to float across the low tension side of the generator during transmission, or to be charged when the transmitter and receiver were not in use.

A special type of fairlead was fitted in the base of the gondola for the trailing aerial, which was 300 ft. in length. This fairlead enabled a new aerial and weight to be fitted while the airship was in flight should it have been found necessary.

Short Wave Receiving Equipment

Special receiving apparatus was utilised both for direction finding and for ordinary service reception. As in all aircraft, economy of space and the minimum of weight were essential features and to meet these requirements several of the units were utilised both for direction finding and service reception purposes.

A Marconi short-wave two-valve receiver, with a wave range of 10-100 metres, was carried. This was intended for communication with Point Barrow, where a short wave transmitter was installed. The aerial for this apparatus was a short length of wire fixed between the wireless cabin and one of the engine gondolas. The receiver operated on the batteries carried for normal working.

Reception on the Radiogoniometer

The direction finding system is of particular interest. It was designed to enable the navigators accurately to determine their position and course, despite the fact that the compasses would have a decidedly reduced navigational value in the region of the Pole itself, due to the earth's magnetic field effect. There was also the interesting and peculiar fact to contend with that actually at the Pole all direction was due south. The direction finder loops were fitted diagonally around the outside of the envelope, the centre of the loops coinciding with the lead-in to the wireless cabin. The loops, which consisted of two turns of wire, spaced about nine inches apart, were doped to the fabric with linen tape, forming an unobtrusive but very efficient fitting.

Inside the cabin, eight terminals were fitted on an ebonite panel and to these the ends of the loops were connected. This enabled the loops to be connected in their parallel or series, as might be found most advantageous on the wave length being received, the change-over being an appreciated addition to the installation.

Reception on the radiogoniometer utilised practically the same circuits as are used for service reception with the trailing aerial. A radiogoniometer unit and a three-range transformer unit were used in conjunction with a high frequency Amplifying Detector and a Low Frequency Magnifier. A low frequency Note Filter was also provided and this could be inserted, when desired, into the circuit between the output terminals of the amplifier and the unput terminals of the note magnifier. A local Oscillation Generator was provided to enable bearings to be taken on the long continuous wave stations.

The transformer unit comprised three air core transformers, with condensers for secondary circuit tuning and covering wave ranges of 2,000 to 5,000, 4,000 to

10,000 and 10,000 to 25,000 metres.

The amplifier was provided with six Type V 24 valves with resistance-transformer coupling for high frequency magnification and a Type QX valve was used for rectification with successful results.

Continuous Wave Reception

The note filter circuit was provided with a single Type V 24 valve and an oscillating circuit tuned by means of a variable condenser. The low frequency magnifier had two transformer coupled Type V 24 valves which could be switched into circuit according to the conditions of reception.

The local oscillation generator utilised one Type V 24 valve, which could be switched into circuit for receiving continuous wave signals.

A 66-volt dry cell battery was tapped at suitable points for supply current to the anode circuits of the receiving valves, and the valve filaments were run off the battery used for lighting the filaments of the transmitting valves.

For the reception of continuous wave, spark and telephone service messages, a "plug-in" coil tuner, covering a wave range of 300 to 25,000 metres, was connected to the high-frequency amplifier in place of the transformer and radiogoniometer units used for direction finding.

The tuner, a coupled circuit instrument, was provided with reaction coupling to the grid circuit. Eleven "plug-in" coils were provided to cover the full wave range, any one of which could be inserted in the aerial, grid, or reaction circuit according to the wave length being received.

The service receiver utilised the same aerial as that used for the transmitter, the aerial being connected either to the receiver or transmitter by means of the Send-Receiving switch, which was mounted in a convenient position on the transmitter panel.

General Layout of Apparatus

The chief difficulty in fixing the apparatus was lack of space in the wireless cabin of the "*Norge*," the operator's quarters being naturally somewhat cramped. Although, in fixing the instruments it thus became necessary to give more attention to convenience of wiring than to appearance, the general effect was very workmanlike.

The receiving apparatus was fixed on two shelves one above the other on the interior wall of the cabin, the forward wall of the cabin being taken up with the transmitter panel. A narrow table was provided on the starboard outside wall for the operator's writing and for the manipulating key. Under the left hand side of the table the transmitter inductance was fitted to the floor, and variometer for fine transmitter wave adjustments was also fitted under the table. Next to these instruments a small triangular cupboard was fitted for carrying spares. The accumulators and dry batteries stood on the floor, out of the way but easily accessible.

A double-pole change-over switch was fitted in the cabin and the 12-volt lighting mains for the ship were brought to this as well as the wireless 12-volt supply. This enabled the ship's accumulator and the wireless accumulator to be charged in parallel from the wireless generator, so that if the ship's main had given out, current could have been supplied from the wireless accumulator, and vice versa.

A Byrd Flies to the Pole!

Our photograph shows Lieut. Com. R. E. Byrd of the U.S. Navy Air Service, who—as mentioned in the article on Polar Exploration by Air in our issue of last month—claims to have flown over the North Pole in his aeroplane.
Commander Byrd's flight was made two days before Amundsen flew over the Pole from Spitzbergen to Alaska in the "Norge."

Aeroplanes in the Arctic

A non-stop flight of 840 miles over the Arctic regions was made on the 31st March this year by two Americans, Capt. G. H. Wilkins and Carl Eilson. The flight was made in a single-engined monoplane and was undertaken on the spur of the moment.

The airmen had left Fairbanks, Alaska, early in the morning on the 600-mile flight to Port Barrow—the base they had selected for a future Arctic flight—with a cargo of 200 gallons of petrol and certain technical apparatus to be stored at the base in readiness. The aeroplane behaved so well, however, that they decided to indulge in an extended trip before landing their cargo. Visibility was remarkably good and at the point over the Arctic Sea where they turned back it was possible, from their altitude of 7,000 ft., to see 60 or 70 miles ahead.

At Port Barrow the arrival of the airmen caused a first-rate sensation and the entire population of 200 Eskimos and a dozen white people rushed to the landing ground, the Eskimos shouting "Flying Devil," or "Devil Bird," in their own language. At first the Eskimos would not go near the machine but stood around frightened yet fascinated. Presently, however, the "King" of the locality and the white lady school teacher stepped up to the machine and proved it to be harmless, and the Eskimos then lost their fear and swarmed around the visitors.

A thrilling return journey was made to Fairbanks, the airmen flying over the rugged Endicott Mountains of Alaska in the teeth of a storm. Finally, after a six-hours' battle with the elements, they had to land at Circle City, 150 miles north-east of Fairbanks, owing to lack of petrol.

FREE FLIGHTS

FOR OUR READERS

In Famous de Havilland "Moth" Aeroplanes

First Prize: A 100-Mile Flight

And Eleven Other Prizes to be Awarded in Simple

COMPETITION FOR NAMING NEW AIR LINERS

AS mentioned last month, we are able (through the courtesy of the de Havilland Aircraft Co. Ltd.) to announce a special competition for the twelve best suggestions submitted by our readers in a contest in which every one stands an equal chance.

Naming the New Air Liners

The de Havilland Aircraft Co. Ltd. are now constructing five three-engined air liners, to the order of Imperial Airways Ltd., to be used on the new passenger, mail, and goods service between Cairo and Karachi.

Our readers are invited to offer suggestions for a suitable type name for these machines. It is important to note that readers are not required to name the individual machines, but to offer a suggestion for a name that may be applied to the particular type to which these machines belong.

For instance, the name "Moth" is applied to a particular type of de Havilland light aeroplane, and not to one individual machine. The individual "Moth" aeroplanes may have their own names, and these appropriately might be the names of well-known moths such as "Puss" (Moth), "Tiger" (Moth), etc.

In the same way the new air liners will probably have individual names, but this will be decided later. What our readers have to do is to choose a name for this particular type of machine, the dimensions of which will naturally be on a gigantic scale in view of the duties to be performed.

Suggestions for Competitors

It is becoming the general practice to give to aeroplanes type names that commence with the same letter as the name of the maker. We have, for example, the Vickers "Vanguard" (described in the June "*M.M.*") the Boulton "Bugle," the Parnall "Pixie," and so on.

In the case of the new de Havilland air liners, therefore, the ideal name would have "D" as an initial letter. The name would also be suggestive of the sphere in which the new air liners will operate, and might describe their work in Empire communication.

None of these conditions, however, need be regarded as essential, and it may be that some reader will send in a bright suggestion, the merit of which will outweigh these desirable qualities.

Competitors Please Note:

REVISED CLOSING DATE, 12th JULY

Not only will the winner have the honour of naming the new air liners, but he will be awarded a prize of either (a) a 100-mile flight in a "Moth" in any direction from Stag Lane Aerodrome (he may choose his own direction for this flight of 50 miles out and home) or (b) two half-hour flying lessons in a "Moth."

Eleven additional flights will be awarded to the senders of the next best suggestions. The sender of the second best suggestion will be entitled to a half-hour's flying lesson on a "Moth," and the senders of the next ten best will be awarded "joy rides" in the immediate neighbourhood of the Stag Lane Aerodrome.

FIRST PRIZE:—A 50-mile flight "Out-and-home" from Edgware. Sketch Map showing 50-mile radius to any point of which the winner may elect to fly.

Note Carefully these Simple Conditions

All suggestions must be submitted on postcards addressed "Air Liner Contest," Meccano Magazine, Binns Road, Liverpool.

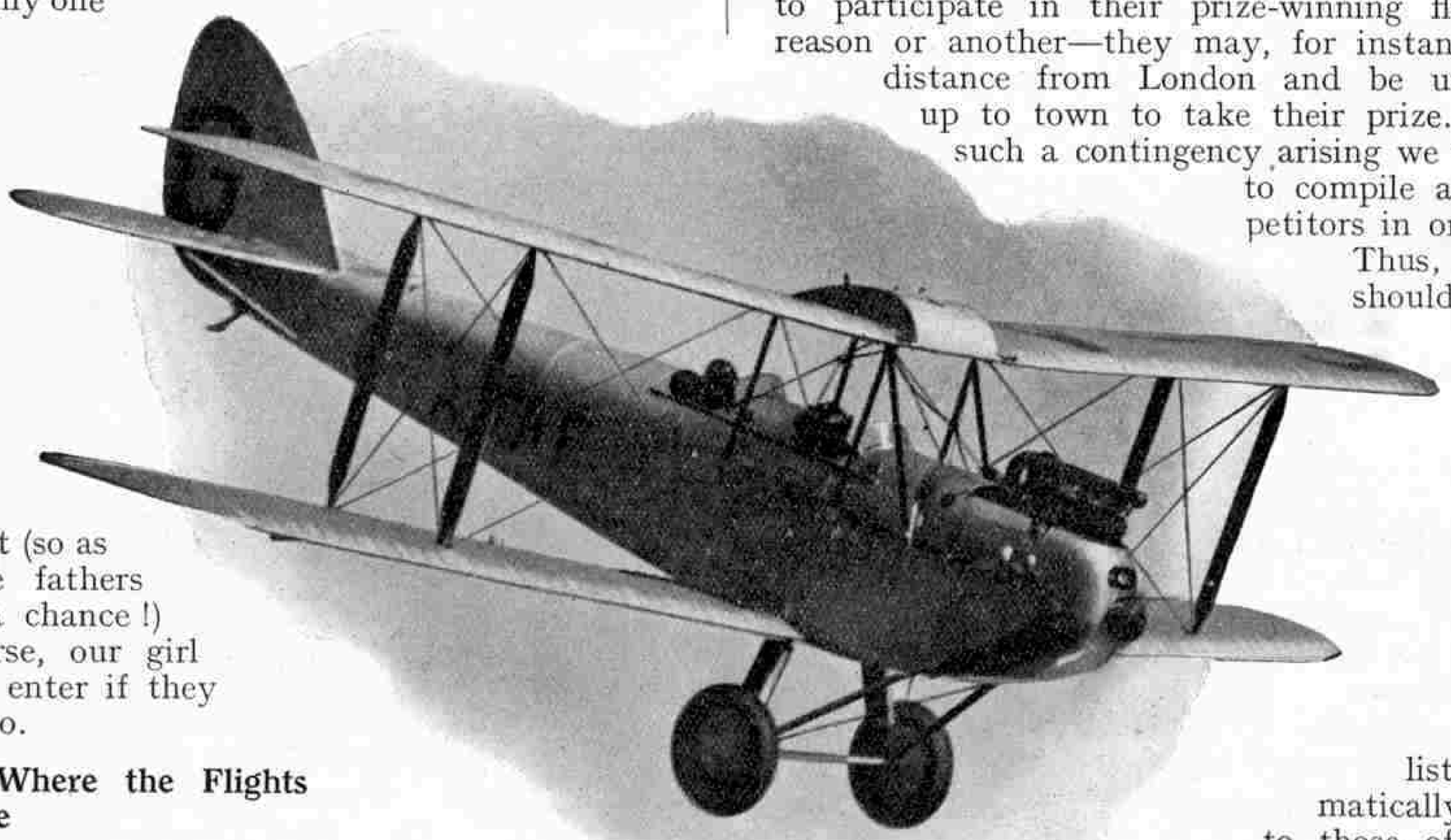
Each postcard must bear only one suggested type name and this should be clearly written on the back of the card in the top left corner. At the bottom of the card should be written the name, address, and age of the entrant.

The closing date for this competition is July 12th and it will not be open to Overseas readers. We hope to announce the result of the contest in

our August issue, or September at the latest.

Readers may submit more than one suggestion if they wish to do so, but additional suggestions must be submitted on separate postcards. Only one suggested name must appear on each card and entries not complying with this rule, and entries not on postcards, will be disqualified.

There is no age limit (so as to give the fathers and uncles a chance !) and, of course, our girl readers may enter if they wish to do so.



A "Moth" in Flight

When and Where the Flights Will be Made

The flights will be made, in August and/or September, from the de Havilland Aircraft Co.'s Aerodrome at Stag Lane, Edgware, Middlesex. The prize-winners must make their own arrangements for reaching the Aerodrome at the appointed time on the day of the flight. Of this they will be notified in good time beforehand and in fixing the dates the winners' convenience will be studied as far as practicable.

Possibly some of the prize-winners may not be able to participate in their prize-winning flight for one reason or another—they may, for instance, live at a distance from London and be unable to get up to town to take their prize. In view of such a contingency arising we are arranging to compile a list of competitors in order of merit. Thus, for example, should the winner of the first prize not be able to take his flight, he could renounce his flight in favour of the next on the list. In this way the list will automatically work down to those of our readers who are able to come up to London to the Stag Lane Aerodrome, or who live in London.

Of course, if the winner of the first prize has to renounce his right to the flight in favour of the next on the list of merit, his suggested type name for the air liners would still be adopted.

The de Havilland "Moth" Light Aeroplane

The D.H. 60 two-seater light aeroplane, popularly known as the "Moth," on which the prize-winners will make their flights, is of particular interest for more than one reason. In the first place, the planes are arranged to fold back along the fuselage to facilitate housing and transport. The open span of 29 ft. required by the aeroplane in flight, is thus reduced to 9 ft. 8 in., with the wings folded back.

Not only does this allow the "Moth" to be stored in an ordinary garage, but it also allows the machine to be easily towed behind a motor-car along a road of ordinary width on which there is other traffic. The operation of folding the wings, or the alternative of spreading them, is not a long job requiring a number of mechanics, but may be performed by one person in less than three minutes.

It was on an aeroplane of this type that Mr. Allan Cobham made his remarkable flight from Croydon to Zurich and back—a distance of about 1,000 miles—in one day, the outward flight occupying six hours and the homeward journey eight hours.

The "Moth" was produced in the first place for use of private owners and Light Aeroplane Clubs, and it has been adopted as the standard equipment of the clubs recently formed in London, Manchester, Leeds, Birmingham and Newcastle.

It is fitted with a 27/60 h.p. four-cylinder Cirrus engine, an air-cooled four-cylinder in-line type. The engine is rated to give 65 h.p. at 2,000 revolutions, and may be run at 2,100 revs., in short bursts. Its normal 60 h.p. is delivered at 1,800 revs. At 1,700 revs., giving the cruising speed already referred to, it is only being asked to deliver 33 h.p. It is then consuming a gallon of petrol per 25 miles flown, and its oil-consumption is a pint an hour.

The petrol tank is divided into main and reserve compartments, the former having sufficient spirit for a three hours' flight, and the latter for half-an-hour. When carrying auxiliary petrol tanks in place of a passenger, a flight can be made from London to Glasgow and back without stopping, and the machine can remain in the air for over twelve hours without landing.

In the "Moth" the pilot's and passenger's cockpits are placed in tandem. There is also accommodation in each for light luggage. Flying is particularly easy with light and effective control down to the lowest speeds and there are no peculiarities of behaviour in any way.

The undercarriage, which employs rubber in compression, absorbs the shocks of landing on the roughest ground. With full load—that is pilot, passenger and 60 lbs. of luggage—the stalling speed is 40 miles an hour. Its top speed is over 90 miles per hour. Other interesting particulars are given in the accompanying table.

A noticeable feature of the engine is the hand starter, which is operated by the pilot from his seat. Generally, the starting of an aeroplane engine requires the assistance of at least two men besides the pilot. The engine of the "Moth" can be started-up without any exertion or difficulty, however, and the pilot can handle and manœuvre the machine on the ground without assistance—a wonderful achievement.

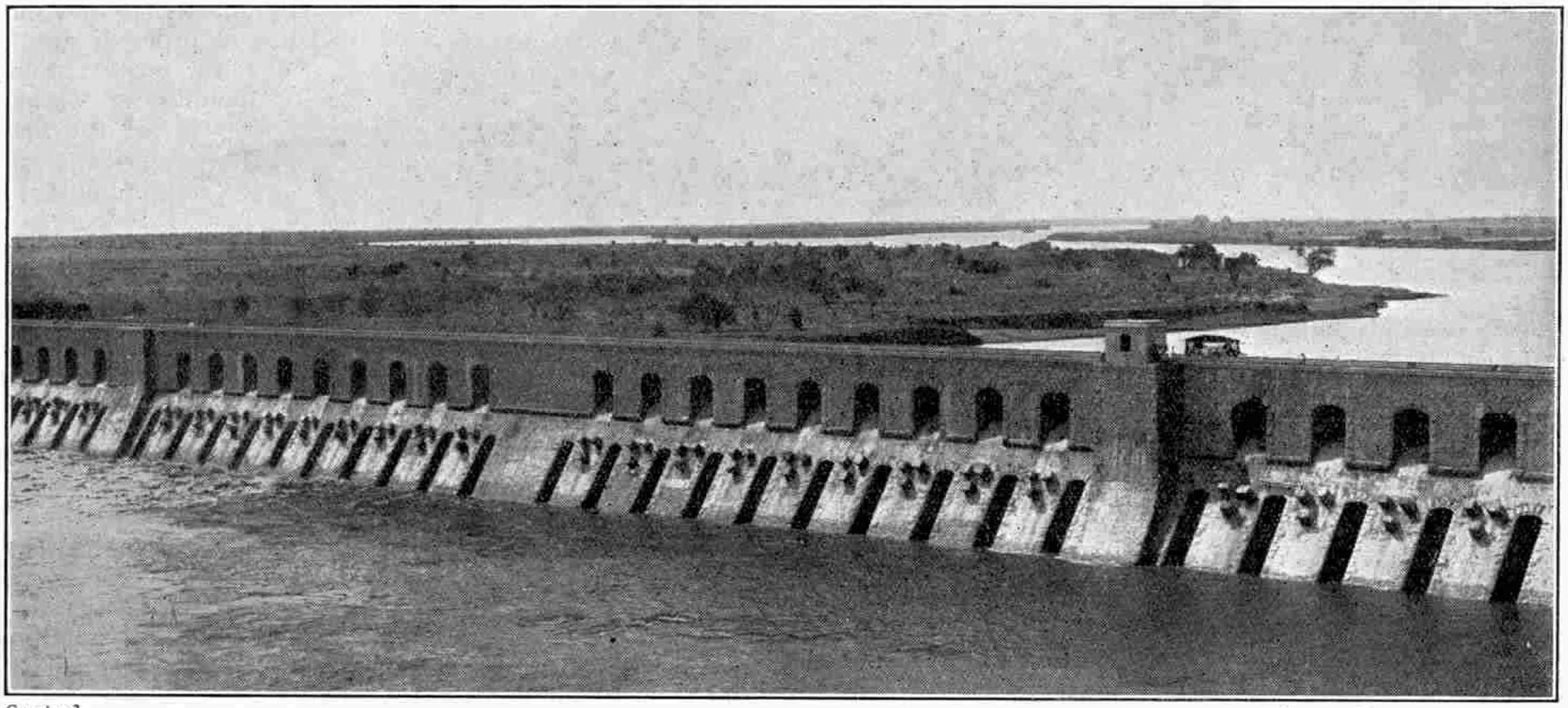
Details of de Havilland "Moth"

Speed at Ground Level	91 m.p.h.
Cruising Speed at 80% full power ...	80 m.p.h.
Stalling Speed	40 m.p.h.
Rate of Climb at Ground Level per minute	430 feet
Height attained at 500 yards from standstill	120 feet
Distance to Unstick (in calm)	120 yards
Run on Ground on Landing (in calm)	80 yards
Ceiling (absolute)	13,000 feet
Range at Cruising Speed	4 hours
Petrol Consumption, per gallon ...	20 miles
Oil Consumption, per hour	1 pint
Weights.	
Weight Empty	770 lbs.
Weight of Petrol (15 gallons)	110 lbs.
Weight of Oil (1¼ gallons)	10 lbs.
Weight of Pilot	160 lbs.
Normal Useful Load	190 lbs.
* Weight with normal Full Load ...	1,240 lbs.
Dimensions.	
Length	23 ft. 6 ins.
Span, Folded	9 ft. 8 ins.
Span, Open	29 ft. 0 ins.
Height	8 ft. 6 ins.

* The Certificate of Airworthiness will allow of a maximum permissible fully loaded weight of 1,350 lbs.

A Million Tons of Masonry!

The Two-Mile Sennar Dam on the Blue Nile



[Messrs. S. Pearson & Sons Ltd. Courtesy]

Downstream Side of Dam, near its centre

IN our July issue last year we gave some particulars of the great Sennar Dam that was then in the course of construction in Egypt. Since that time the Dam has been completed—at a total cost of £8,500,000, including the canal system—and was officially opened a short time ago.

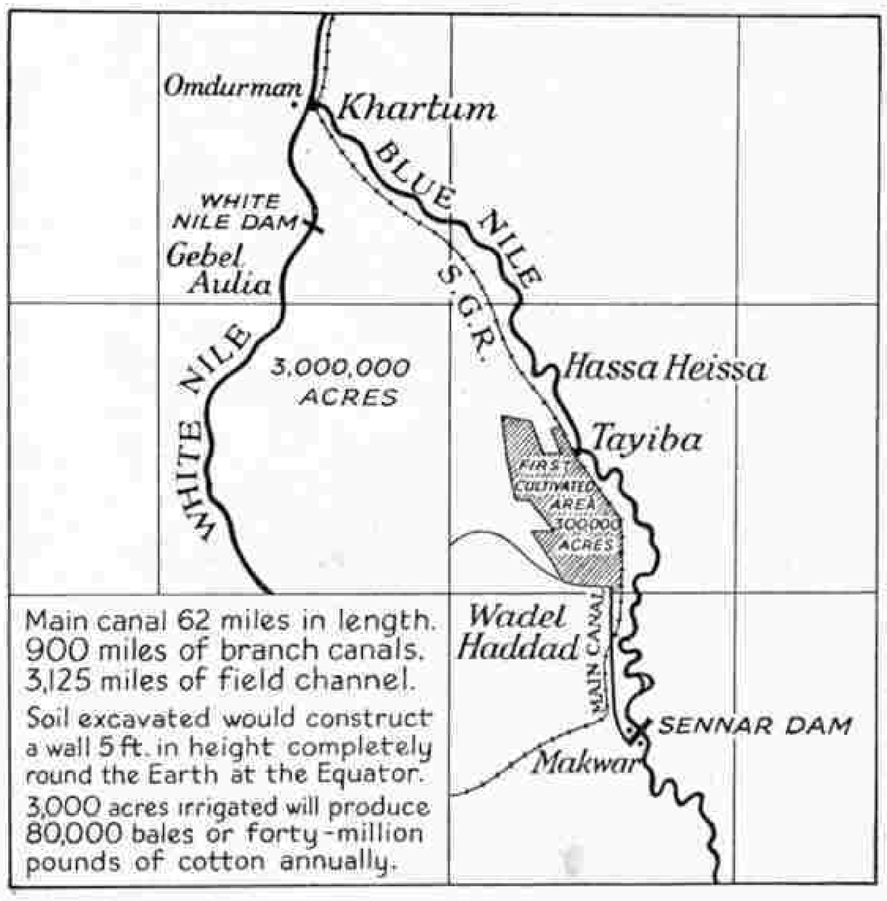
Whereas the illustrations published in the article referred to, showed only portions of this great engineering work in the course of construction, we are now able to illustrate the completed barrage. Our readers will no doubt be interested to compare the two sets of illustrations, as they afford an interesting series of views.

The Sennar Dam, named after a town in the neighbourhood, is built across the Blue Nile at Makwar, a small village some 170 miles south of Khartum. This is the chief town in a province of the Egyptian Sudan, and is situated at the junction of the Blue and White Niles.

Khartum figured prominently in the Egyptian War and was the centre of some heavy fighting. Our readers will no doubt remember that it was here that (in 1885) the brave General Gordon was killed—only two days before the relieving force came in sight—after he had defended the town heroically for several months. After his murder, the town remained in the hands of the Dervishes until September 1898, when it was retaken, together with the whole of the Sudan, by a force of English and Egyptian troops under the command of Kitchener. Since that time, great improvements in the town have been made and there are now fine public buildings and wide streets, where before existed native houses and congested areas, with the invariable accompaniment of disease and sickness.

The building of the Sennar Dam was not only a subject for consideration by engineers, but had also peculiar political considerations. For instance, for some time there has been considerable feeling between the Egyptians and the Sudanese. Egypt controls the Nile from its source, and as the Egyptians have used the waters of the Nile from time immemorial, they claim an established right not only to the waters but also to the fertilising silt that these waters carry with them. Thus, any suggestion for using the Nile waters to irrigate lands on the banks of the Upper Nile in the Sudan, had to be made so that these historic claims were not endangered.

The people of Egypt are fully alive to the situation and this is abundantly shown by the fact



Map showing the great Plain of Gezireh

that some of them have even argued that as Egypt has control of the Nile from its source, the Egyptians should be allowed to control the Sudan itself—a suggestion, of course, that cannot be countenanced for many reasons. As it happens, an equitable arrangement is possible by which there is more than sufficient water in the Nile to supply several times over the requirements of the Sudan as well as those of Egypt.

After the battle of Omdurman considerable thought was given to making some such arrangement, by which areas in the Upper Nile country could be irrigated without endangering the claims of the Egyptians lower down the river, who required the use of the waters for similar purposes. It was finally decided that the great Plain of Gezireh was a most suitable area to be placed under irrigation with this object in mind. The plain, which lies in the fork formed by the Blue and White Niles, is located at a distance of 50 miles upstream from Khartum. The country hereabouts had hitherto been little better than a desert area, and nothing had been grown on it except perhaps a little millet, and even then, at the best, the crop was uncertain and was entirely dependent upon the tropical rains.

Courtesy [*Messrs. S. Pearson & Sons Ltd.*

Crane for Operating Sluices

The idea was to irrigate a part of this area. If the soil was found to be suitable for the cultivation of cotton, the crops would handsomely supplement the supplies received by the mills of Lancashire from other parts of the world.

For the experiment pumps were installed on the river bank to pump up water for the irrigation of this test area. In due course the results were found to be so entirely satisfactory that it was decided to proceed with the irrigation of some 300,000 acres, leaving something like 3,000,000 acres, and this vast area remains capable of cultivation if it is decided to extend the scheme at some future date.

The plan having been decided upon, it was arranged to obtain the necessary water by damming the Blue Nile. The most suitable site was decided to be that at Makwar, for here the river is divided by a small island and a large mass of hard rock. The rock provided a suitable foundation—just as the Britannia Rock did for the great bridge across the Menai Straits—and the island enabled the engineers to deal with one channel at a time, and to divert the river to one side or the other, whilst laying the foundations of the dam.

The dam itself, 9,925 ft. or nearly two miles in length, contains over one million tons of masonry. The height above foundation level is 120 ft. and the greatest width between the parapets at the level of the coping is 90 ft., which width gradually tapers to 23 ft. at the top.

As a result of building the dam, a lake is formed two miles in width and five miles in length. This lake, of course, is in the immediate vicinity of the dam, but as a result of the barrage the water level of the river is affected for nearly 100 miles up stream, and it will retain some 22,500,000,000 cubic feet of water. The use of this water will not injure Egypt in any way as it will be taken at that season of the year when it is not required by Egypt, and if not so used would simply run into the Mediterranean to waste.

A great quantity of fertilising silt is held in suspension by the waters of the Nile, and this material is of great value for making the land productive.

In the ordinary course a reservoir would act as a settling tank for this silt, and were this allowed to occur, the waters would not only be deprived of a considerable proportion of their value, but also in the course of time the river bed on the upstream side of the dam would fill up. This problem was encountered when building the Assouan Dam, however, and it was then successfully solved by the introduction of special sluices.

The same system has been adopted in the Sennar Dam and the central portion, 875 yards in length, is pierced by 80 large sluices, each $6\frac{1}{2}$ ft. in width and $27\frac{1}{2}$ ft. in depth. The silt-laden water passes through these sluices and carries with it the particles of material brought down from higher up the river. Thus only clear water is impounded by the dam.

In addition to its original purposes it was arranged that the Sennar Dam should also serve as a railway bridge for the Sudan Government Railway. For this reason the dam was probably built rather higher than otherwise would have been necessary, as the track had to be kept above the level of the highest floods. To counteract the increased height a spillway was constructed at a higher level than the sluices, giving a double row of openings, as shown in our illustration. Embedded in the masonry, below each opening in the spillway are massive stones, which serve to break up the force of the falling water, and so help to protect the foundations of the dam.

Next month we hope to give some details of the construction of this great engineering achievement.

(To be continued)

Electricity

XXVIII. TELEGRAPHING PICTURES *(continued)*

LAST month we gave an illustration of a photograph transmitted by the Marconi system of telegraphing pictures and also of the apparatus by means of which it was transmitted. Fig. 1 on this page shows in diagram form the principle by which this apparatus operates.

A transparent positive film of the photograph to be transmitted is attached to the glass cylinder G by means of clamps. Inside this cylinder is a source of light A, focussed so that its beam comes to a point at the surface of the film on the cylinder G. After passing through the film the beam of light enters the box D mounted on the threaded rod E, and passing through the lens B falls on the light-sensitive cell C.

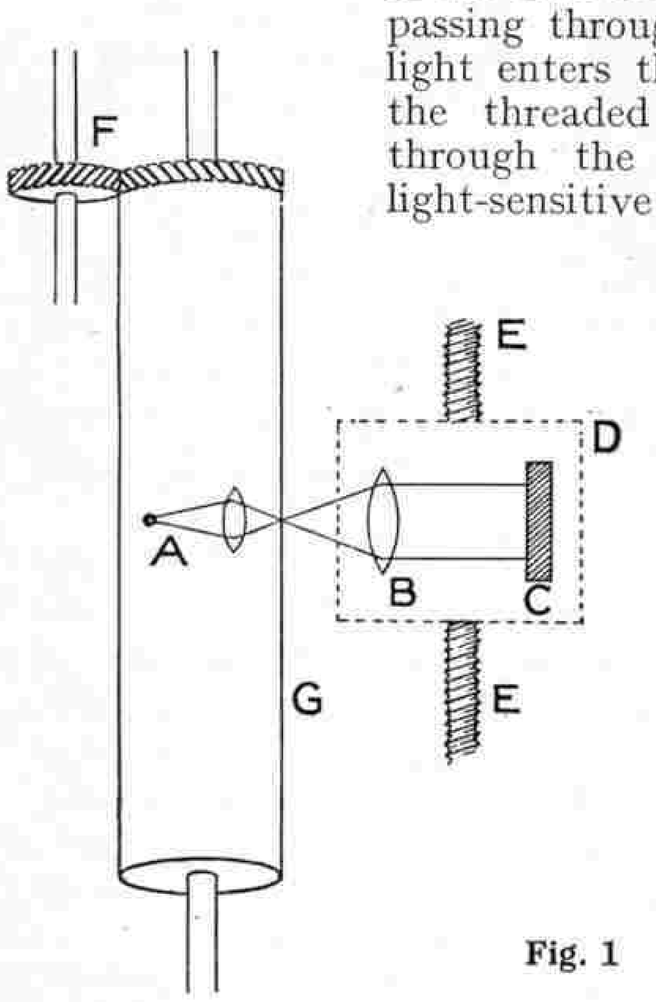


Fig. 1

The cylinder G is rotated through the gears F by an electric motor (not shown) and at every half-revolution its direction of rotation is reversed, so that it alternately turns in one direction and then in the other. At every reversal the box D, containing the light-sensitive cell, is moved sideways a fraction of an inch by means of the rod E in a direction parallel to the axis of the cylinder G, and with it is moved also the source of light A.

The Transmission

At the beginning of a transmission this box and the light source are moved to one end of the cylinder so that the beam of light shines through one end of the picture. It is obvious that the amount of light reaching the cell C will depend upon the density of the particular small area of the film that comes between A and C—that is, on the density of the point of film through which the light passes. Since the cell C is light-sensitive, the amount of electricity flowing in a circuit that includes C in its path will be controlled by the strength of the light beam.

Each time the cylinder G completes a half-revolution the box D and light A are moved sideways one step, and thus in time every portion of the picture is brought in the path of the light beam and each part is in succession translated into an electric current of a strength corresponding to the density of that particular part.

This current is usually too weak to be transmitted to the receiving station, and it is first amplified and then fed into an ordinary telephone line circuit or into the controlling section of a wireless transmitter, this system of telegraphing pictures being equally suitable for transmission by wire or wireless, providing that, in the latter case, atmospherics do not interrupt and cause distortion.

How the Picture is Received

The duty of the receiving apparatus at the distant station is to receive this fluctuating current and to translate it back into a reproduction of the original picture that was mounted on the glass cylinder of the transmitter. The photograph illustrated last month was drawn by a pen, and it will be seen on examining it that the ink line, which is broad, moves across the direction of its motion in the lighter parts of the design so as to make a thinner line.

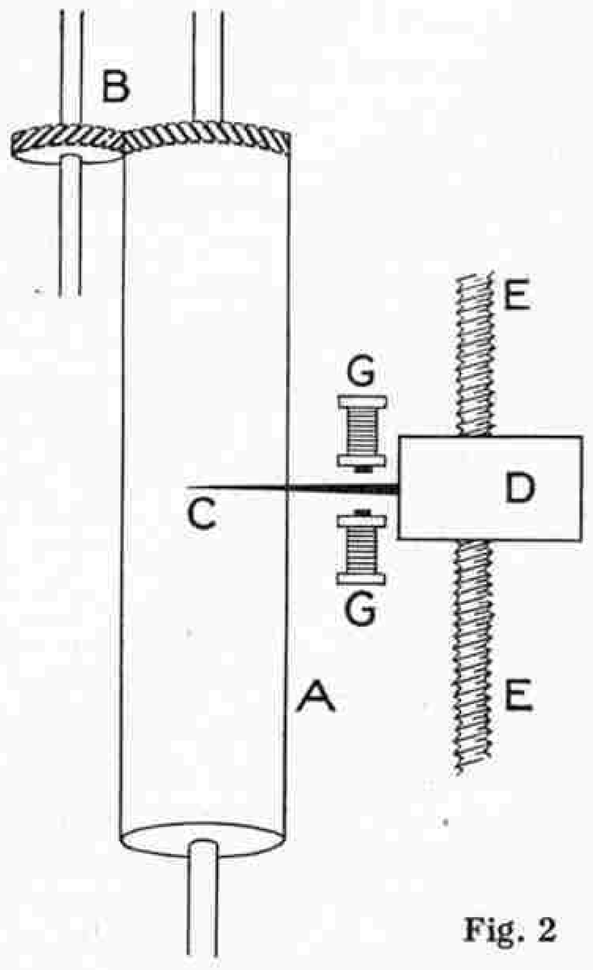


Fig. 2

A simplified diagram of the essential parts of such a receiving apparatus is shown in Fig. 2, where A is a cylinder on which is clamped a piece of ordinary white paper on which the drawing is to be made. This cylinder is rotated backwards and forwards in half-revolutions through the gears B by a motor, in the same way as the transmitting cylinder of Fig. 1.

On this cylinder (A, Fig. 2) a special type of fountain pen C presses, this pen being mounted on the carriage D,

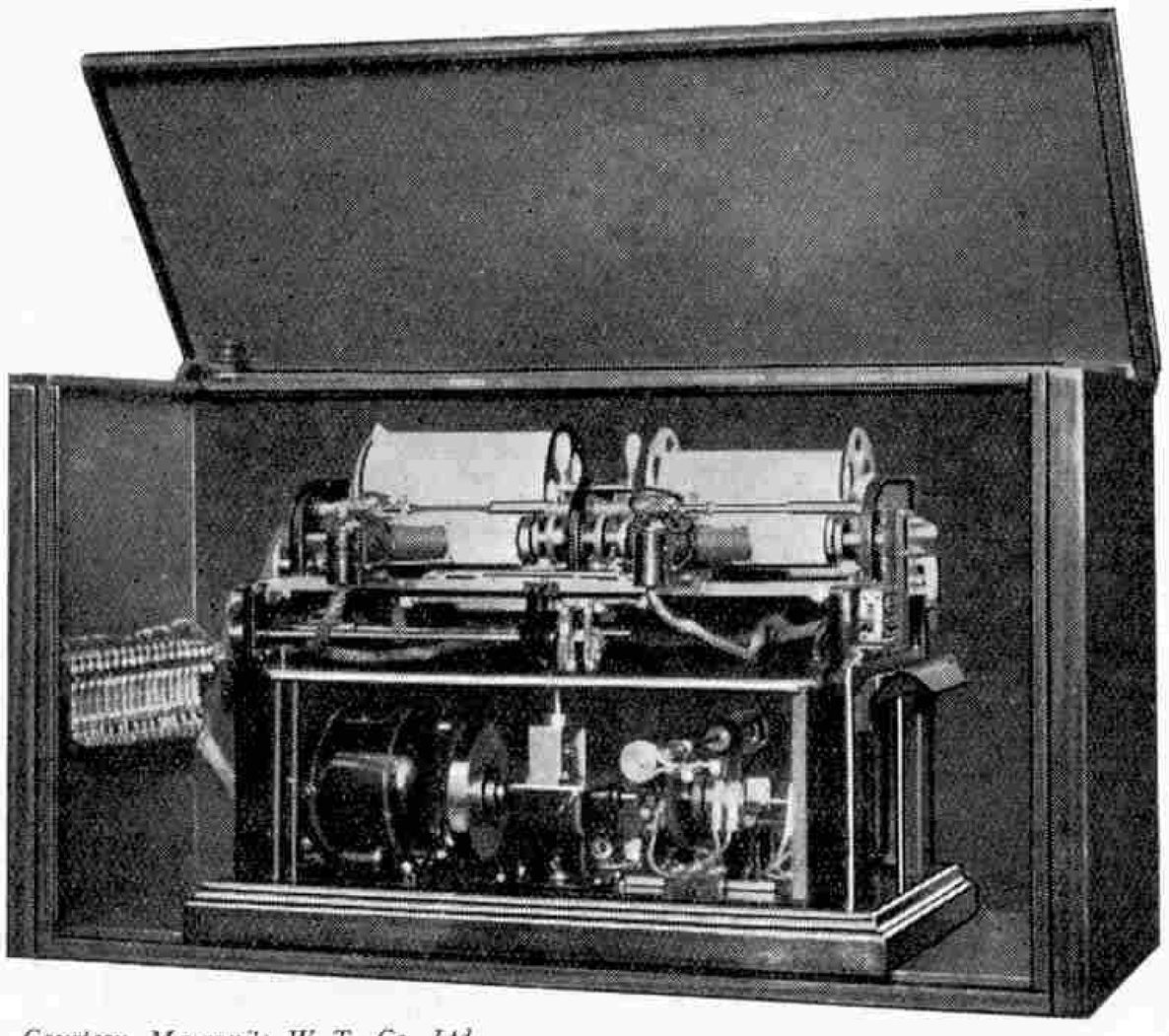
which is propelled sideways by the threaded rod E at every reversal of the motion of the cylinder A. This sideways motion is exactly the same as that of the box D in Fig. 1 containing the light-sensitive cell.

Method of Operation

The pen carriage D is set opposite one end of the cylinder A at the beginning of the receipt of a photograph, and during the course of time this pen carriage gradually works towards the other end of the cylinder in unison with the similar sideways movement of the light cell box of the transmitter. It thus will be seen that, during the reception of a picture, the pen crosses and recrosses the paper in a series of parallel lines until the whole is covered.

The small wavy motions of the pen that determine the lightness or darkness of a particular part of the picture are controlled and caused by the two small electromagnets G, which are mounted on the pen carriage D and travel sideways with it.

The advantage of this system of reception, in which the picture is reproduced in ink, over photographic methods, is that the operator of the receiving apparatus is able to see the picture growing bit by bit during the actual time of reception. He is able therefore to detect any faults that may be occurring and to take steps to rectify them and perhaps save the picture from being a failure.



Courtesy, Marconi's W. T. Co. Ltd.

Receiver of Marconi photo-radiogram service

Electro-Chemical Method of Reception

Another method of receiving the electric current and converting it back into a visible picture relies upon the fact that paper wetted with a certain chemical solution darkens when an electric current passes through it. The piece of paper, having been moistened previously with the solution, is wrapped round a metal drum. This drum rotates either continuously in one direction or backwards and forwards, according to the system of transmission, and on it there presses the fine point of a needle with a platinum tip. This needle presses on the paper the whole time, its tension never varying, and either it or the drum carrying the paper moves sideways step by step in the usual manner as the transmission progresses.

The incoming electric currents are first amplified and then made to pass through the wet paper from the platinum needle to the metal roller. The needle thus leaves a line of discolouration behind it, the depth and breadth of this line depending upon the strength of the electric current at the particular moment. Since the strength of this current is varying continuously in accordance with the depth of particular portions of the transmitted picture, it follows that the depth of the chemically-produced line will vary correspondingly, and thus the original picture is reproduced.

Neither of these two methods of receiving the electric signals produces a perfect picture without apparent grain. At the same time both the Marconi system and the electro-chemical system, which we understand is the invention of Mr. T. Thorne Baker, the well-known British experimenter, have their own peculiar advantages for particular purposes. The Marconi system is specially suitable for transmitting photographs intended for newspaper reproduction and the Thorne Baker system has as its advantage the simplicity of the apparatus required both for transmitting and receiving.

Synchronising the Cylinders

It is of vital importance in all systems of telegraphing pictures that the two cylinders carrying respectively the transparent film and the receiving paper should rotate at exactly the same time and the same speed, and further, that the sideways steppings of the light cell and of the pen should be absolutely identical.

In the Marconi system we have been describing this is accomplished by means of special electric motors for driving the cylinders, used in conjunction with a special type of tuning fork controlling their speed. In this way the two cylinders rotate at exactly the same rate and are reversed at the same moment. The carriages are stepped forward at each reversal by the same electric motors that drive the cylinders, and the accuracy of their motion becomes a matter of the accuracy of the manufacture of the instrument itself, especially in the cutting of the threaded propelling rods.

In some systems the apparatus is arranged so that the receiving cylinder revolves slightly faster than the transmitting cylinder, and stops at the completion of each revolution or half-revolution according to the particular system. The receiving cylinder is then restarted by the transmitter at the same instant that the cylinder on the transmitter begins its next movement, in a somewhat similar manner to that employed in certain methods of clock synchronisation.

Another method makes use of two pendulums, one at the transmitting and one at the receiving station. These pendulums are adjusted so that they both swing at exactly the same rate, and before each transmission they are further adjusted so that they are swinging in unison, that is they are in step with one another.

Although this system produces excellent results, it would not seem to be so precise as that employed by Mr. Thorne Baker during his recent experiments between London and Manchester. In these experiments he caused both cylinders to stop at the end of each revolution, both being restarted by magnetic releases controlled by relays situated at both stations but connected in series with one another and controlled by one pendulum

The Story of Metals

XI. SILVER: ITS ROMANTIC HISTORY

SILVER undoubtedly was one of the earliest metals to be discovered and most likely it was found at the same time as lead, for the two metals often occur together. It is probable, however, that its discovery was not made until gold had come into use for ornamental purposes, and copper and tin for making bronze for weapons and tools.

From the earliest days of which we have any record silver has been associated with gold for ornament and decoration, and in the Bible and other ancient writings the names of the two metals are often coupled together in descriptions of royal magnificence and the beautification of temples.

Silver objects of obvious antiquity have been found from time to time in Eastern countries such as Persia and Egypt, and after minute examination experts have declared many of them to date back to the 5th century B.C. This opinion is confirmed by references to silver mining contained in various ancient manuscripts that have been preserved.

Mines of Athens

In the early records of Greek history it is related that in 85 B.C. the mines of Athens were yielding annually something like 84,000 ounces (Troy) of silver. Between 50 and 60 years later the mines were abandoned, however, as the workings became exhausted. The skill of these ancient miners was demonstrated conclusively about 60 years ago when one of these mines was re-opened. On examination of the workings it was found that the only ore rock that remained was that which had resisted the attacks of the crude implements used by the miners of that day.

One of the first sources of supply of silver was Spain. When the Romans invaded and conquered that country they took over the mines and worked them energetically and with very successful results. The Greek historian Polybius, writing of the silver mines of New Carthage, states that they were situated about two miles from the city and were extremely large, employing regularly as many as 40,000 people. The products of these mines considerably enriched the Roman finances, and Diodorus of Sicily declared that so plentiful was the metal that ships voyaging to Spain returned with silver anchors!

British Production

It is probable that silver was mined in Britain at a very early period, and certainly before the Roman occupation. When the Romans had conquered the country and begun to settle down they commenced mining for lead in various districts, and a certain percentage of silver was obtained at the same time. When the Romans left the country mining began to be neglected, and it remained at a very low ebb for some centuries. It was not until towards the close of the 15th century that the working of metals was taken up on a really commercial basis.

This stimulation of mining was due to some extent to the shortage of silver coinage in England at that time and also during the first half of the 16th century. In 1547 a definite move to increase production was made by placing the mines under the control of a State body called "The Society for the Mines Royal." Sir Hugh Myddleton of Chirk Castle supervised the running of the mines for several years and afterwards the properties were leased to him and very successfully developed.

A mint was erected in Aberystwyth Castle in 1631 by the decree of Charles I, for the more economical coining of the silver mined in that locality. The Civil War that raged in England from 1642 to 1649 naturally interfered greatly with industrial progress and in consequence of various disturbances the mint was moved to Shrewsbury in 1647.

From an [*old engraving*

Refining in the 16th Century

The steady increase in the importation of silver from foreign sources during the last 50 years has re-acted very unfavourably upon British production and to-day most of the silver mines in this country are stagnant.

Origin of the word "Dollar"

The developing of silver mining on the Continent of Europe during later centuries seems to have commenced with the Przibram Mines in Austria, which even to-day rank amongst the deepest in the world.

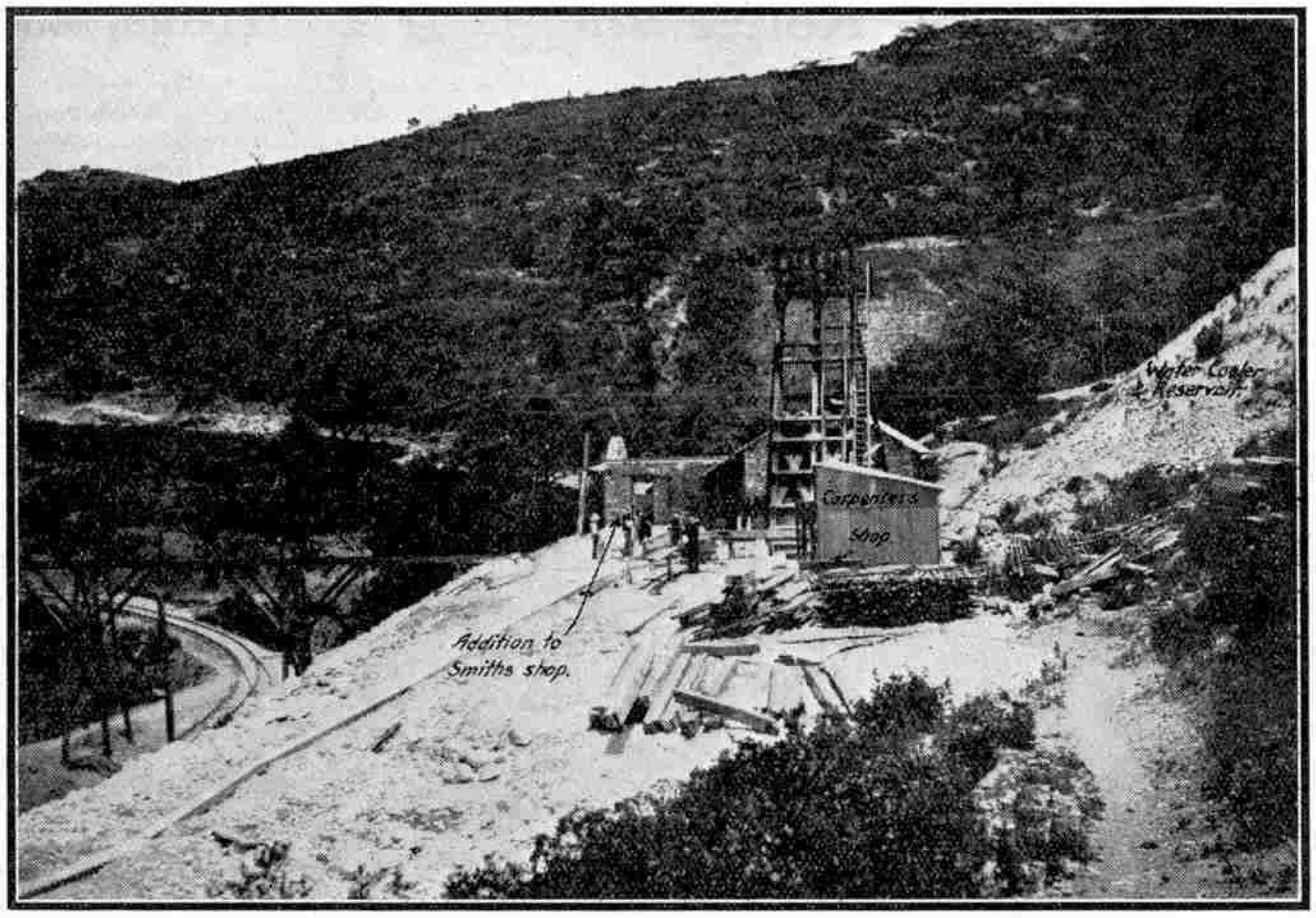
It is interesting to note that the word "Dollar" originated in Austria. The abundance of silver mined at the old town of "Joachimsthal" (Joachim's Vale) in Bohemia resulted in the establishment there of a mint. The silver coinage struck was at first named "Joachimsthaler" but this was soon shortened to "Thaler" and was later interpreted by western civilisation as "Dollar."

Spanish Invasion of Mexico

The Spanish invasion of Mexico and Central and South America resulted in the wholesale appropriation and exploitation of the vast mineral wealth of this region. Early in 1519 Hernando Cortes landed in

Mexico at the point where now stands the city of Vera Cruz. Having destroyed his ships he marched inland towards the capital. On the way his small force was joined by many thousands of natives who were only too glad of the opportunity of striking a blow at their ancient enemies the Aztecs. Montezuma, the Aztec King, received the invaders as friendly visitors and displayed quite openly the magnificence and wealth of his kingdom, at the same time presenting his guests with gifts of shields, helmets and cuirasses ornamented with plates of gold, and various ornaments of the solid metal.

Possibly Cortes had intended to try to possess the country by "peaceful penetration," but if so, this plan was speedily abandoned. The lavish display of gold and silver excited the greed of the Spaniards to an uncontrollable extent. Without warning they made a prisoner of Montezuma, and by way of asserting their dominance massacred the bewildered and leaderless population without mercy. After some two years of bitter and ruthless fighting the Spaniards made themselves masters of the situation and in 1522 Cortes was appointed Governor and Captain-General of the "New Spain."



Courtesy] [*H. S. Denny*

A Typical Silver Mine: The Trinidad and Nevada Shaft, Mexico

The methods of mining introduced by the Spaniards were a great advance upon the crude methods of the natives, and as a result the output of the mines increased enormously. It is estimated that during the period of 300 years in which Spain governed Mexico that something like £800,000,000, principally in silver, went to enrich the Spanish treasury. When Mexico regained her independence in 1821, mining activity slackened, and before long many of the mines were abandoned. Others have remained in operation however, up to the present day.

Peruvian Mining Methods

The Spaniards did not confine their attentions to Mexico. The conquest of Peru by Francisco Pizarro in 1532 gave them access to further mineral wealth on a vast scale. As was the case with the Aztecs, the Peruvians carried on their mining on very crude lines. Prescott in his "Conquest of Peru" gives the following description of their methods:—"They did not attempt to penetrate into the bowels of the earth by sinking a shaft, but simply excavated a cavern in the steep sides of the mountain, or, at most, opened a horizontal vein of moderate depth. They were equally deficient in the knowledge of the best means of detaching the precious metal from the dross with which it was united, and had no idea of the virtues of quicksilver—a mineral not rare in Peru—as an amalgam to effect this decomposition. Their method of smelting the ore was by means of furnaces built in elevated and exposed situations, where they might be fanned by the strong breezes of the mountains.

"The subjects of the Incas, in short, with all their patient perseverance, did little more than penetrate below the crust, the outer rind, as it were, formed over those golden caverns which lie hidden in the dark depths of the Andes."

Trevithick and Robert Stephenson

Readers of the *"M.M."* will remember that in 1814 Richard Trevithick became interested in a scheme for operating mines in Peru and constructed nine pumping engines and shipped them to Lima. These engines proved very successful and in 1816 Trevithick set out for Peru taking with him other engines. He was received with the wildest enthusiasm on his arrival at Lima and it was actually proposed to erect a statue of him in solid silver!

Unfortunately this state of affairs did not last long. The War of Independence broke out, Trevithick's engine-houses and pumping machines were destroyed, and he barely escaped with his life. He reached Cartagena in a penniless condition and there was fortunate enough to meet Robert Stephenson, who lent him sufficient money to enable him to return to his home in Cornwall. Robert Stephenson was also on his way home after his extremely trying experience in charge of mining operations in Colombia, on the eastern slopes of the Andes. The task he undertook was the difficult one of re-opening mines that had been worked in bygone days by the Spaniards. The old workings were completely overgrown and lost and everything had to be begun over again.

The story of how Peru gained her freedom was told in the *"M.M."* for February and March last.

The Spaniards also added to their colonies Colombia, Chili and Bolivia, and in each case extracted as much of the mineral wealth as possible.

The decline of silver mining in South America after the Spanish evacuation prepared the way for the great Comstock Lode discovery, some 40 years later. Next month we shall relate the story of this great sensation of North America.

MECCANO STANDARD MECHANISMS

Section VII. Roller and Ball Bearings, etc.

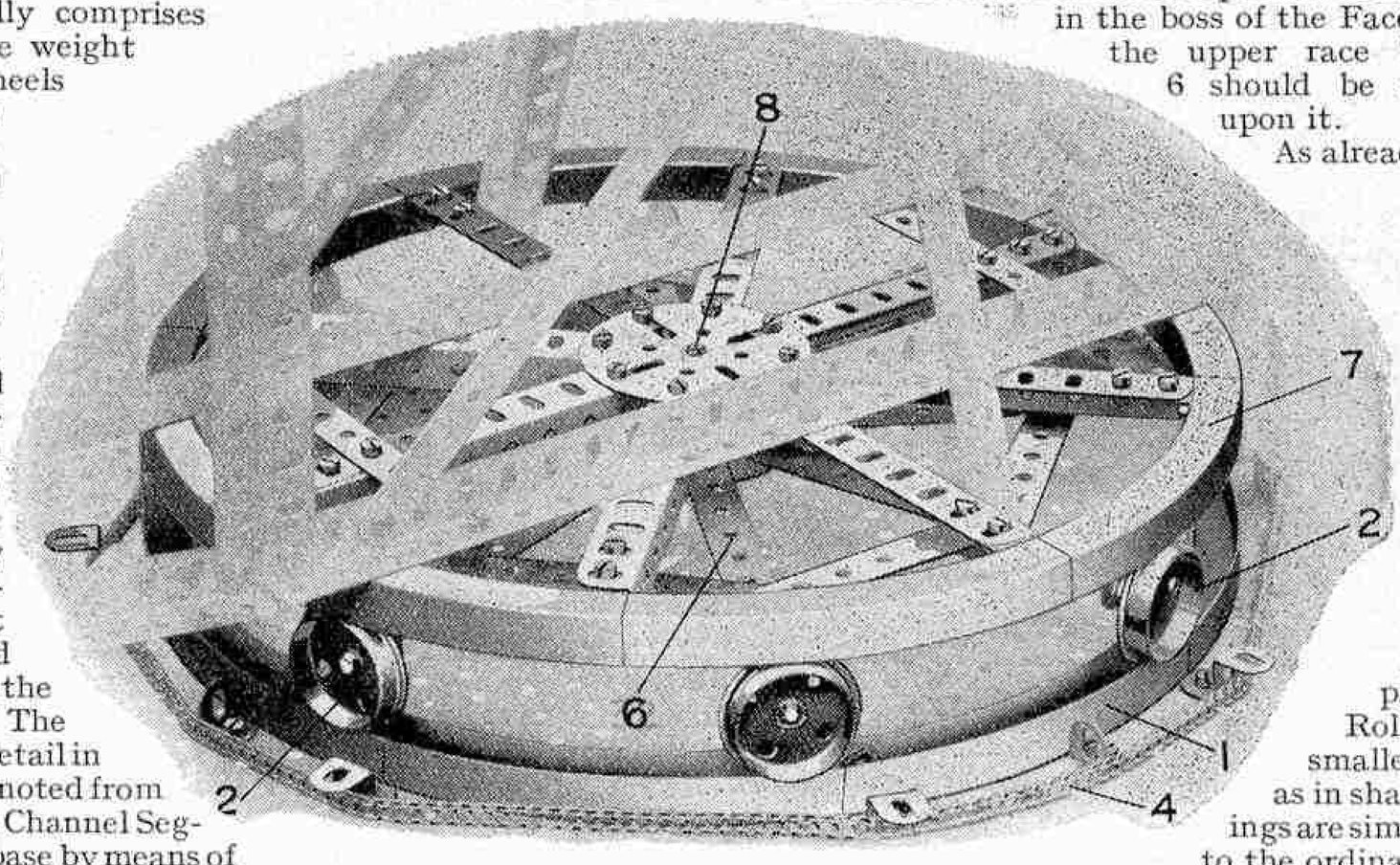
This article is the ninth of a series explaining some new and interesting aspects of Meccano model-building practice. Previously we have dealt with Gear Ratios, Belt Mechanism, Pulleys, Levers, Clutches, Drive-Changing Mechanisms, Brakes and Retarding Appliances, and the following article describes how swivel- and journal-bearings may be constructed from Meccano to withstand exceptionally heavy loads or strains. It will be apparent that these "Standard Mechanisms" may be adapted with advantage to numerous Meccano models.

WHERE a heavy mass is to be rotated about an axis, it is necessary to devise some method of relieving the tremendous strain that otherwise would be imposed upon that axis. The method adopted to obtain the additional support required usually comprises the distribution of the weight of the mass over wheels or rollers arranged at a distance from and rotating round the central pivot.

Standard Mechanism No. 101 is an excellent illustration of the type of roller, or wheel, bearings frequentlyused for the rotation of large cranes, revolving bridges, and other heavy structures. The lower, or stationary guide rails 1 are constructed from eight Channel Segments, and form a track upon which the wheel race 2 revolves. The fixed guide is shown in detail in S.M. 101A, and it will be noted from the illustration that the Channel Segments are bolted to the base by means of four of the eight 1″ × ½″ Angle Brackets 3. The Sprocket Chain 4 shown in this figure illustrates a method of rotating the crane jib or other structure of which the track 1 forms the base; a vertical driven rod situated on the rotating structure carries a Sprocket Wheel placed *within* and engaging the chain loop 4. The latter is arranged round the series of Angle Brackets 5. On rotation of the Sprocket Wheel, the chain 4 tends to grip the brackets and becomes immovable, whereupon the Sprocket commences to travel *round the chain*, carrying the pivoted structure with it.

Eight Flanged Wheels forming the wheel race are attached to the spider-frame 6 (S.M. 101B) by means of eight 1½″ Double Angle Strips, the ends of which provide bearings for the short axles. The revolving guide rail 7 (S.M. 101) is secured to the base of the upper or rotating part of the structure, and rests upon the wheels 2. This guide rail is built up from eight further Channel Segments bolted in the form of a circle and secured by means of 1″ × ½″ Angle Brackets to eight 4½″ Angle Girders. The latter are arranged like the spokes of a wheel and converge upon a Face Plate forming the hub. The superstructure may be bolted in any convenient manner to the 4½″ Girders.

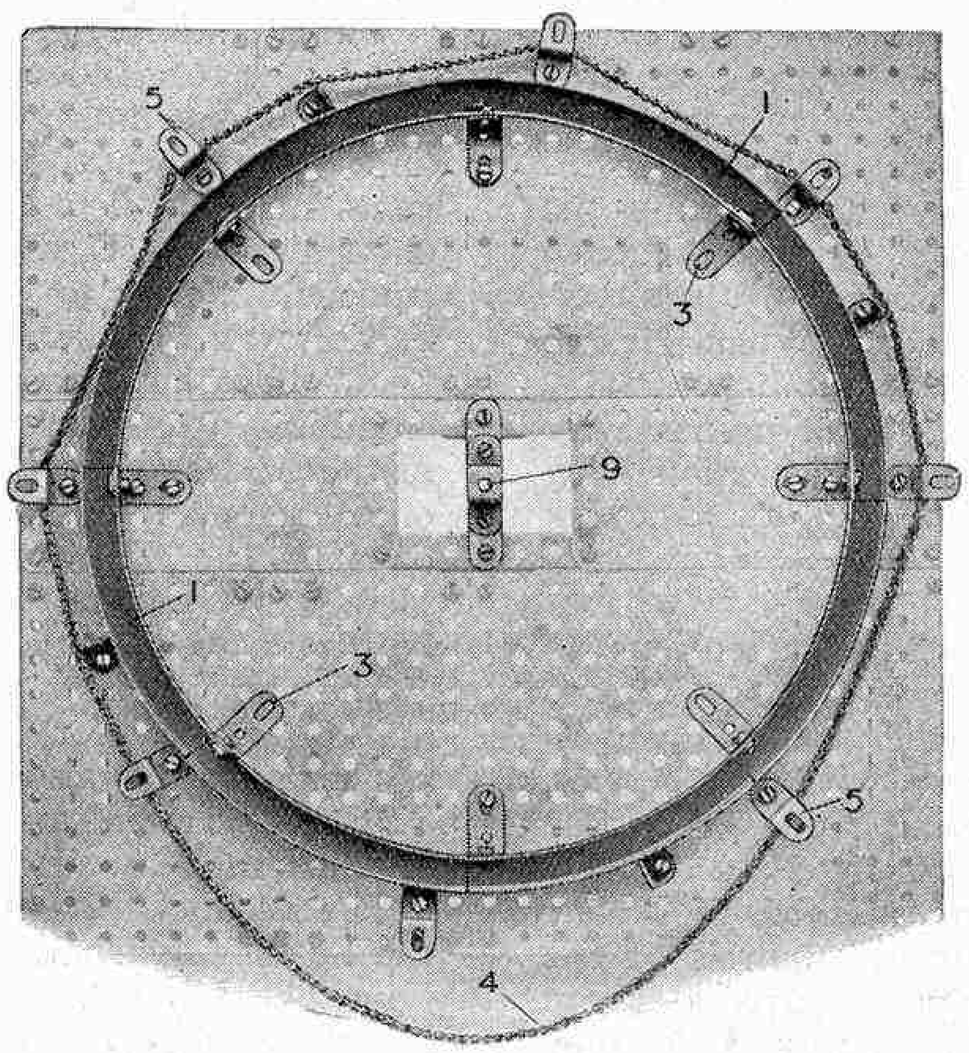
A shaft 8 is journalled in the bearing 9 (S.M. 101A) and forms a common axis for the spider-frame and revolving race 7, both of which rotate at different speeds. The shaft 8 should be secured in the boss of the Face Plate forming the hub of the upper race 7, but the spider-frame 6 should be allowed to swivel freely upon it.



S.M. 101

As already intimated, rollers sometimes take the place of wheels in actual practice. The rollers are of no great length but their diameters are usually made as large as possible, since an increase in size means a proportional decrease in friction. In addition, the rollers are tapered, as a rule, towards one end, in order that they shall describe a correct circle about the central pivot of the structure.

Rollers are also employed in smaller types of bearings, such as in shaft-journals, etc. Such bearings are similar in design and operation to the ordinary ball-bearings (see S.M. 104), but the advantage obtained from the employment of rollers in place of balls exists in the fact that the surface of contact, or the area over which the strain is imposed, is increased considerably. Thus, in a journal-bearing, the rollers are placed longitudinally to the journal, and the latter is supported upon the entire length of each roller, whereas in ball bearings the contact surface is comparatively very small.



S.M. 101a

S.M. 102—Knife-Edge Bearing

The knife-edge is employed almost universally in weighing-machines, balances, etc., where it is necessary to reduce friction in a moving lever to an absolute minimum. The steel or agate prisms (or "knife-edges") used in actual practice are represented in the Meccano movement shown in S.M. 102 by two Centre Forks 1 secured in a Coupling 2, with their points resting between the teeth of two ½″ Pinions 3. The latter are nipped by their set-screws to a short Rod rigidly held at either end in a Crank 4. The beam 5 is secured in the centre hole of the Coupling 2, and it will be noticed that the lever arms 6 and 7 are bolted in Couplings 8 at a lower level than the Coupling 2; the beam is shaped in this way in

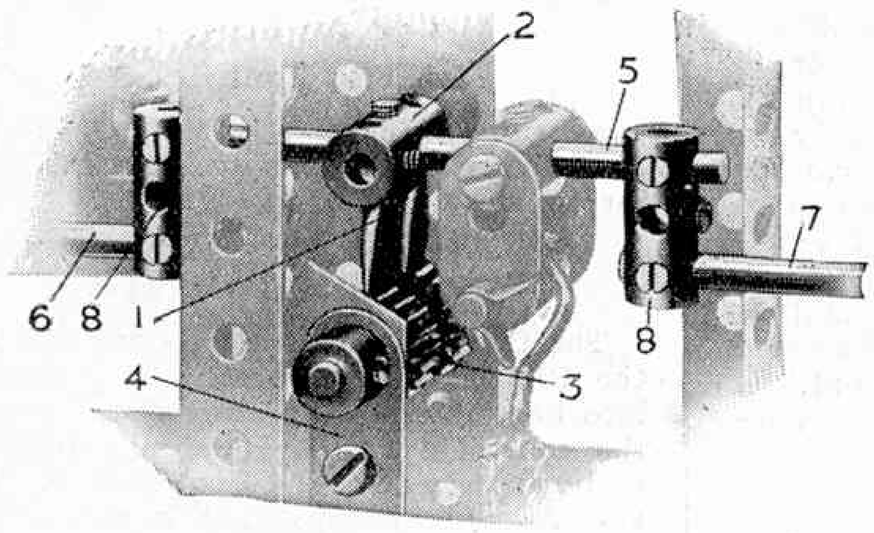
order to lower the centre of gravity at the fulcrum 1.

S.M. 103—Reinforced Bearing

Where a shaft is subjected to unusual pressure it is advisable to extend, or reinforce, the ordinary bearing afforded by a Meccano Strip or Plate. A useful example of the construction of reinforced bearings for a back axle will be found in the Meccano Tractor (Model No. 712 in the Complete Manual of Instructions). The axle in this model is journalled through a 1½″ Pulley (with set-screw removed) securely bolted to each side plate in such a manner that the axle is free to turn in its boss. The recess cut in the boss of the Pulley to receive the set-screw forms a useful receptacle for oil when lubricating the axle.

S.M. 104—Ball Bearings

The standard Meccano ball bearing is constructed from two 3″ Pulley Wheels, one Wheel Flange, and twenty-one Steel Balls, and is applicable chiefly in models where a weight is required to impose vertically upon a pivot. The fixed ball-race is built up from the Wheel Flange and one 3″ Pulley bolted together, with the boss of the Pulley protruding through the centre of the Wheel Flange, and secured to any suitable base. The balls are placed in the groove formed between the outer edges of this Pulley and the circumference of the Wheel Flange, and the second Pulley, which should be bolted to the swivelling portion of the model, rests upon their upper surfaces. The Rod forming the axis of the 3″ Pulleys should be secured in the boss of one of the Pulleys, but allowed to pass freely through the boss of the other. This arrangement permits the swivelling motion to be actuated by suitable gearing connected to the Axle Rod, such as that described in the following example. When the Pulleys are placed together, it is impossible for the balls to move out of position.



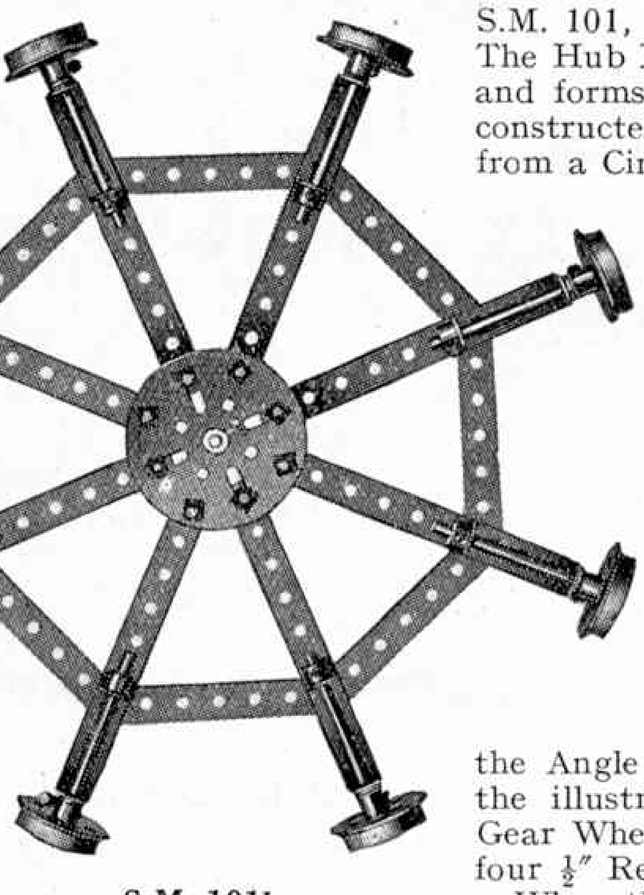
S.M. 102

S.M. 105—Ball Bearing Applied to Swivelling Crane

S.M. 105 shows the jib of a small crane running on Meccano ball bearings. The Rod 5, about which the jib pivots, is secured in the upper Pulley 1, which is bolted to the jib. The latter may be rotated about its pivot on operation of the Crank Handle 8, which transmits motion to the Rod 5 by means of the Worm 7 engaging with the 57-teeth Gear Wheel 6. The jib is secured to the base by a Collar bolted on the Rod 5 just beneath the platform 3. The Pulley 2 is immovable.

S.M. 106—Roller Bearings

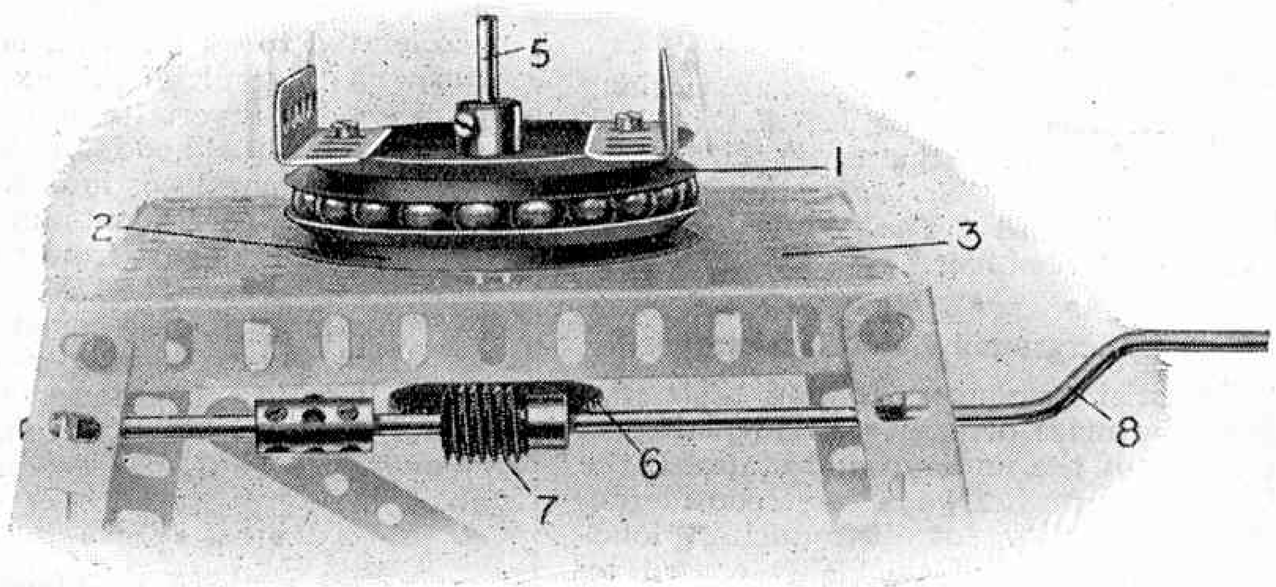
The swivel-bearing shown in this illustration is similar in principle to S.M. 101, but is designed for use in smaller models. The Hub Disc 1 is bolted to the base 2 of the model and forms a guide upon which runs the wheel-race constructed from four ½″ Pulleys 7, pivotally carried from a Circular Strip 6. A Circular Girder 3 bolted to the upper platform 4 of the model rests upon the Pulleys 7. The model pivots about the Rod 8, which passes through the Girder 9, but the weight of the rotating body is distributed over the Pulleys 7, so obviating the strain that would otherwise centre upon the pivot 8.



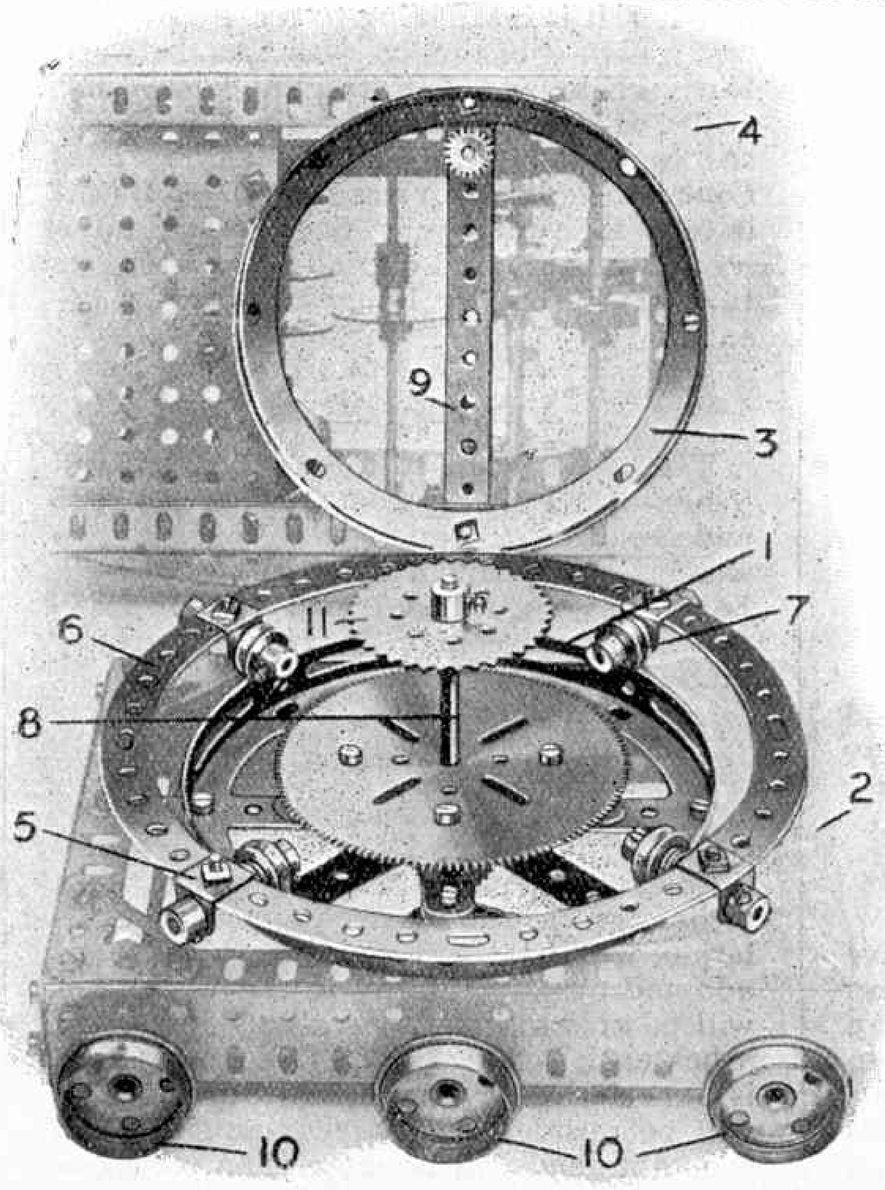
S.M. 101b

It will be of interest to note the method by which the rotating movement of the superstructure is effected. The necessary power is imparted from an Electric Motor secured to the swivelling platform 4 and connected by suitable worm and wheel gearing to a vertical shaft, the lower end of which, after passing through the Angle Girder 9, carries the ½″ Pinion shown in the illustration. This Pinion engages with a 3½″ Gear Wheel bolted to the Hub Disc 1 by means of four ½″ Reversed Angle Brackets.

When the vertical shaft carrying the ½″ Pinion is set in motion, the Pinion travels round the circumference of the large Gear Wheel, and thus causes the superstructure to rotate about its axis. The Rod 8 forming the axis is free to rotate in the boss of the Gear Wheel, and is used to transmit the drive to the road wheels 10. The drive is first led from the Motor to the 2″ Sprocket Wheel 11, and the motion is conveyed to the axle of the central pair of Flanged Wheels through Bevel Gears.



S.M. 105



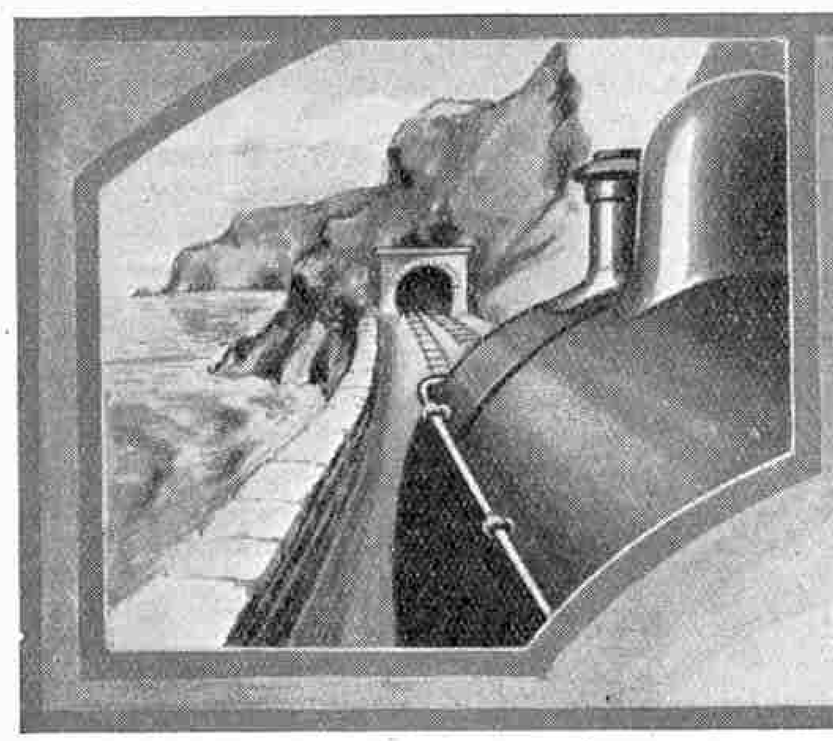
S.M. 106

Alternative Ball Bearing

An alternative and very compact Meccano ball bearing, designed to support a weight imposing vertically on a pivot or for use as a step-bearing, etc., may be constructed as follows: a Flanged Wheel is mounted upon a vertical Rod, with flange uppermost, and five Steel Balls are placed within it and arranged round the Rod. A Face Plate, or 1½″ Pulley, etc., is then mounted upon the Rod so that it rests upon the upper surfaces of the balls. If possible, the Flanged Wheel and vertical Rod should be secured in position, while the superstructure, which is bolted to the outer holes of the Face Plate, is free to revolve about the Rod. If the latter is required to rotate, however, while the Flanged Wheel remains secured, the Face Plate or the part used in its place must be bolted to the Rod.

We wish to add that the above suggestion was first brought to our notice by G. S. Marsh, of Blackpool, who will receive the usual award for his idea.

NEXT MONTH: **Steering Gear**



Railway News of the Month

New L.N.E.R. Goods Locos

Thirty-five goods engines, 0–6–0 type, are under construction at Darlington for the L.N.E.R. They will bear numbers 1400, 1401, 1403–1411, 1413–1417, 1419–1424, 1426–1428, 1434, 1437 and 1440–1447.

* * * *

Pacifics at Work

The following named Pacifics are working on the N.E. Section of the L.N.E.R.:—2568 "Sceptre," 2571 "Sunstar," 2572 "St. Gatien," 2574 "St. Frusquin," 2575 "Galopin," 2576 "The White Knight" and 2580 "Shotover."

* * * *

Underground Loud-Speakers

To assist passengers to find their way amid the maze of passages and platforms at some of the underground stations, the Underground Railways are considering the desirability of introducing loud-speakers. Much of the delay caused by inspection of sign-posts and destination boards could be avoided in this manner, as passengers could be directed on the "public announcement" system.

* * * *

S.R. Statistics

During 1925 over 300,000,000 passengers were carried on the Southern Railway and of these nearly 49,000,000 were conveyed at workmen's fares. Over 18,000,000 tons of minerals and general merchandise were transported.

The total mileage run by S.R. engines was nearly 60,000,000, of which 44,000,000 miles were actual train miles, the remaining 16,000,000 being made up of 10,000,000 miles shunting and 6,000,000 miles covered by light engines. The electric services, covering a track mileage of 647 miles, ran over 7,500,000 miles.

* * * *

New Track in Nicaragua

Forty miles of new track are to be laid down by the Pacific Railroad Company of Nicaragua to connect with the interior of the country and the Atlantic coast.

* * * *

Peat as Loco Fuel

The adoption of peat as a locomotive fuel is contemplated by the Latvian Railway Administration, which is of opinion that, properly organised, a Latvian peat industry could be built up to offer a serious rivalry to coal. Vast quantities of peat are available in the country and the railways could consume 160,000 tons per annum.

Oil-Burning Locos

The L.M.S. Railway recently converted ten of its passenger express locos to burn oil fuel, and after a number of tests in actual service the officials expressed themselves as well satisfied with the results. On a trial run between Liverpool and Crewe the driver stated that the loco accelerated to 60 miles an hour in record time. As a result of this experiment it is proposed to convert 100 locos, but there is very little likelihood of the company converting more locos in this way in view of the huge coal plants at the various depots, entirely apart from the big cost of such conversions. The L.M.S. uses normally something in the neighbourhood of 4,000,000 tons of coal per year, and as 500 gallons of oil perform only the same amount of work as three tons of coal, the change-over would not be directly profitable.

* * * *

Railway Excursions

At a time when hardly anyone travels by rail for pleasure without inquiring whether a suitable excursion train is running, it is interesting to recall that the first railway excursion was run between Nottingham and Leicester on 20th July, 1840. It was organised by the founder of the world-famous travel bureau, Thomas Cook. The first trip was so successful that in the following year Cook organised a second venture and carried 570 passengers from Leicester to Loughborough at 1/- each.

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A Century Old Seal

The original seal of the Canterbury and Whitstable Railway Company, dated 1825 and bearing a design representing two wagons being drawn along the rails by a horse, has been found in a pile of scrap metal and presented to the Canterbury Museum.

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Coke Reclamation Plant

The Boston and Maine Railroad Company is proposing to spend £10,000 in the establishment of a plant to recover coke from locomotive ashes. This projected installation will be the first of its kind to be adopted on any railway in the world and will be able to handle nearly 2,000 tons of ashes each week. From this quantity it is expected that some 6,000 tons of coke will be recovered each year and the fuel thus obtained will be more than sufficient to supply the needs of the railway for heating its stations.

New Electric Railway in U.S.A.

A new electric railway is being planned to link up the cities of Central Florida with the east and west coasts. The line is to be built by private enterprise and will consist of three sections, Orlando to Palatka, Orlando to St. Petersburg, and Sanford to Dayton Beach, ultimately linking up with Jacksonville.

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L.N.E.R. Tank Locos

Messrs. William Beardmore & Co. have received an order from the L.N.E.R. for twenty 0-6-2 side-tank locos.

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The Rhodesian Railways

The British South African Company and the Rhodesian Government have entered into negotiations respecting the extent of the control over the Rhodesian railways to be exercised by the Government. The Government declares that it will obtain control by legislation if a satisfactory agreement is not reached.

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New Swiss Railway

A new narrow gauge railway operated by steam power is to be opened this month by the Swiss Federal Railways. The line is known as the Furka Railway and in its 60 miles' length it crosses more than 50 viaducts and passes through 12 tunnels. Just before reaching its highest point, 7,093 ft. at Furka, the line passes through a tunnel one mile in length under the Furka Pass.

This railway will provide considerably improved facilities for visitors to the country, for its completion will achieve through communication between the Engadine in the east and Lausanne in the west.

* * * *

Railway Companies as House Owners

An interesting sidelight upon the interest displayed by the railway companies in the welfare of their employees is afforded by the information that over 57,000 houses are owned by the principal companies in Great Britain. The great majority of these are occupied by railway men. The L.M.S. Railway leads the way with nearly 26,000 houses.

* * * *

Mersey Tunnel Railway?

Inquiries are being made to explore the possibility of constructing a railway through the lower portion of the new Mersey Tunnel.

Highest Points Reached by Railways

The comparatively level nature of the railways in Great Britain will be best appreciated when it is stated that at only fourteen places do the tracks climb to more than 1,000 feet above sea level. The highest point reached is the summit of Snowdon, 3,140 ft., by the Snowdon Mountain Railway, which works on the rack system. The nearest approach to that altitude is 1,485 ft. recorded between Dalnaspidal and Dalwhinnie on the L.M.S. Railway, Highland section, and 1,405 ft. at Dalnaspidal Station and at Leadhills Station, the latter being on the Caledonian section of the L.M.S.

These altitudes afford an interesting contrast with the highest point touched by any railway in the world, namely. 15,809 ft. at Collahuassi, on the Antofagasta and Bolivian Railway, Chili. This figure is closely followed by 15,583 ft. on the Peruvian Central Railway at Galera Tunnel, and 14,665 ft. at Portez del Cruzera, on the Peruvian Southern Railway. The highest reached in Europe is 8,344 ft. on the section between Nice and Viovolia in the South of France; and in Africa, 8,320 ft. at the Mati Summit on the Uganda Railway.

The Darjeeling-Himalayan Railway holds the Indian record with 7,407 ft., while the Canadian record is attained at Stephen, 5,296 ft., by the C.P.R. The New South Wales Railways touch 4,473 ft. at Ben Lomond, this being the highest point reached by Australian railways.

A figure of special interest is that of 6,316 ft. attained by the Ceylon Government Railway's 30 inch gauge at Kandapola, the highest point reached by the Ceylon 5 ft. 6 in. gauge being 6,225 ft. at Pattipole.

Altogether there are twelve points in the world recorded as exceeding the 10,000 ft. mark, six in North America and the remainder in South America.

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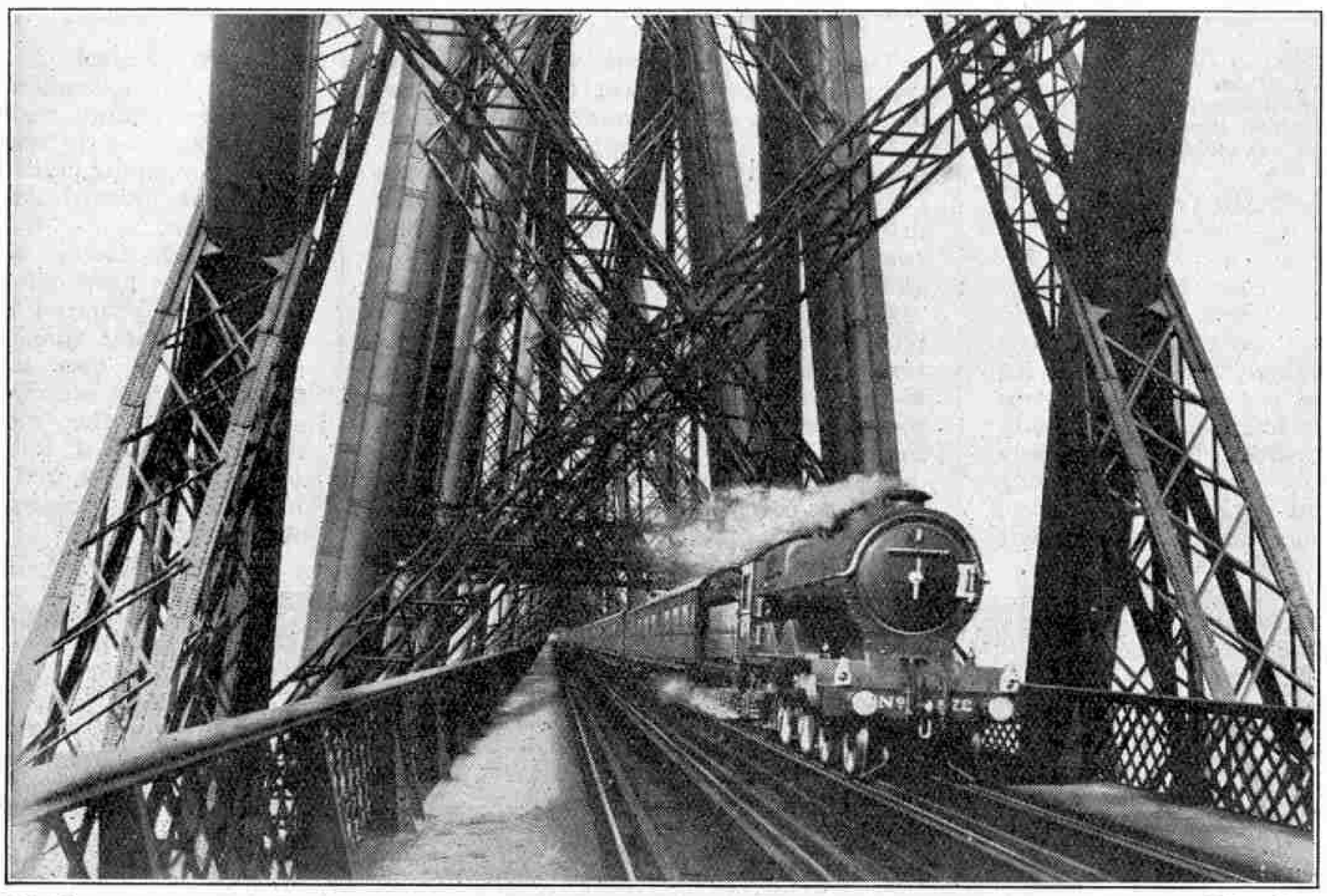
New South African Workshops

The South African Railways and Harbour Administration propose to build two new workshops at a cost of nearly £2,800,000. One shop is designed to produce nearly all the rolling stock that is likely to be required during the next 25 years and the other will be devoted to manufacturing spare parts. Working at full pressure, it is estimated that employment will be given to approximately 2,500 men, and it is probable that the net result of this extension of operations will be that considerably fewer orders will be placed outside the country.

Argentine Railway Developments

A considerable proportion of the £10,000,000 grant that the Argentine Government are devoting to improvements and extensions of the Government railways is to be devoted to the construction of a new line across the Andes, in Northern Patagonia. The line will run from San Antonio on the Atlantic seaboard to Puerto Montt, a large Chilian seaport, via the Bariloche Pass, the total distance being approximately 100 miles.



Photochrom

The "Aberdonian" on the Forth Bridge

An extension is to be made also through San Antonio and Carmen de Patagones to link up with the Buenos Ayres Great Southern Railway. The Great Southern Railway at present works a line from Bahia Blanca to Zapara, 73 miles from the Argentine frontier. It is proposed to carry this line over the Andes into Chili, joining up with the Chilian Central Railway at Temuco. With this new line into Chili communication between the two countries will be more regular, as the existing line, lying further north and crossing the Andes via the Cumbre pass at a much greater altitude, is often blocked by snow.

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Huge Railway Car

An exceptionally large steel bogie carriage, the first of 75 under construction for the Egyptian State Railway, was recently conveyed from Birmingham to Birkenhead by the L.M.S. Railway. The coach measures 69 ft. in length, and weighs approximately 40 tons.

Its movement between the two towns presented some awkward problems and the journey had to be made by a special train running at a very slow speed, no other traffic being allowed to pass on an adjoining line. The coach was fitted with screw-over bolsters to enable it to be moved on the bogies to one side or the other, to permit its passage alongside station platforms and past bridges and signal posts. The position of the coach on the bogies was altered five times.

British Saloons for "Blue Train"

Considerable interest was shown in the recent shipment of saloon coaches to France via the Harwich—Zeebrugge train ferry. These coaches were built in Birmingham for the Compagnie Internationale des Wagon-lits for use with the famous "Blue Train" that runs between Paris and the Riviera, holding the same place in the affections of French railway enthusiasts as does the "Flying Scotsman" in Great Britain.

Owing to the enormous size of the new saloons considerable difficulty was encountered in transporting them to Harwich, and nearly all the undercarriage springs and roof fittings had to be removed to enable them to negotiate our British tunnels and bridges.

An inspection of the coaches showed an unusual degree of luxury, and especially interesting were the arrangements in the dining car kitchen. One marvelled how it was possible to store all the necessary provisions for the preparation of an elaborate meal in so confined a space, but the secret lies in the compactness of the fittings. The actual cooking is carried out by electricity generated in the undercarriage.

It is interesting to note that, prior to the inception of the Harwich-Zeebrugge ferry, the Birmingham manufacturers were compelled to despatch their coaches in sections for erection and decoration abroad.

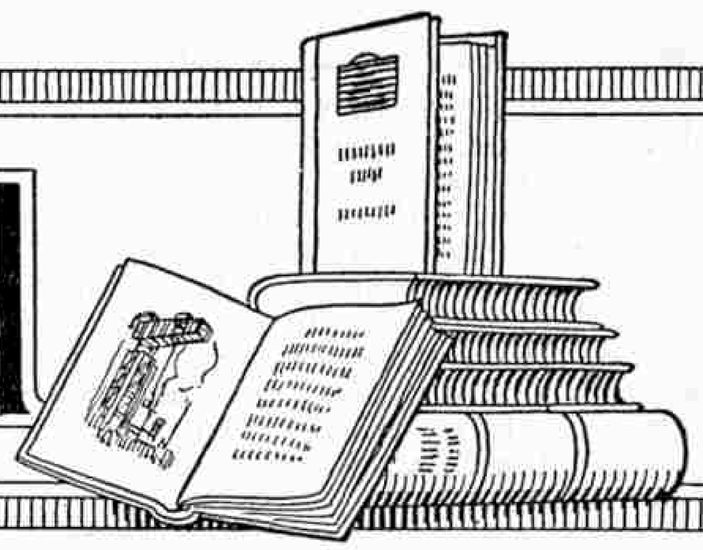
* * * *

G.W.R. Strike Traffic

Out of the temporary chaos produced on the railways during the recent general strike, there emerge some interesting figures as to the manner in which the companies met the crisis. On the G.W.R. during the eleven days of the strike 836 freight trains were operated, and it is estimated that between them these trains carried some 70,000 tons. The passenger service also increased as the strike went on, and from 194 trains on 5th May the number gradually increased until on 14th May 1,245 trains were running. The actual train mileage covered on this latter date was 28,101, nearly 27 per cent. of the normal daily passenger train mileage.

A specially interesting feature was the manner in which the milk traffic was handled. At Paddington station on 11th May, 10,825 full churns were handled, a record in the history of the company, the average daily number of churns dealt with at Paddington throughout the past year being approximately 5,500.

Books to Read



Readers frequently write to me asking if I can recommend books that are both of interest and of use. On this page I review books that specially appeal to Meccano boys. I do not actually supply these books, which may be obtained either through any bookseller or direct from the publishers.—EDITOR.

"Half Hours with the Telescope"

By Dr. W. H. Steavenson

(Published by Longmans, Green & Co. Price 5/-)

There must be many Meccano boys who have small telescopes and many more who wish they had them! Although this book is particularly intended for the former, it is not without general interest to anyone interested in a study of the heavenly bodies. It deals mainly with the elementary principles underlying the construction and working of telescopes, and gives instructions for their adjustment and use. Four chapters are devoted to a descriptive account, illustrated with maps and diagrams, of the more interesting objects in the heavens that are within the reach of a small telescope. There are also chapters devoted to the planets, the Sun, and the Moon.

The book, originally written by a well-known astronomer 60 years ago, has now been brought up-to-date, having run through no less than fourteen editions. It remains the best guide for the amateur astronomer, and although it does not deal with such enthralling subjects as "Is Mars Inhabited," it is to be commended to the attention of all who prefer the practical to the theoretical, and more particularly to those who possess, or have access to, a telescope no matter how small.

* * * *

"Structural Steel Work"

By Atkin

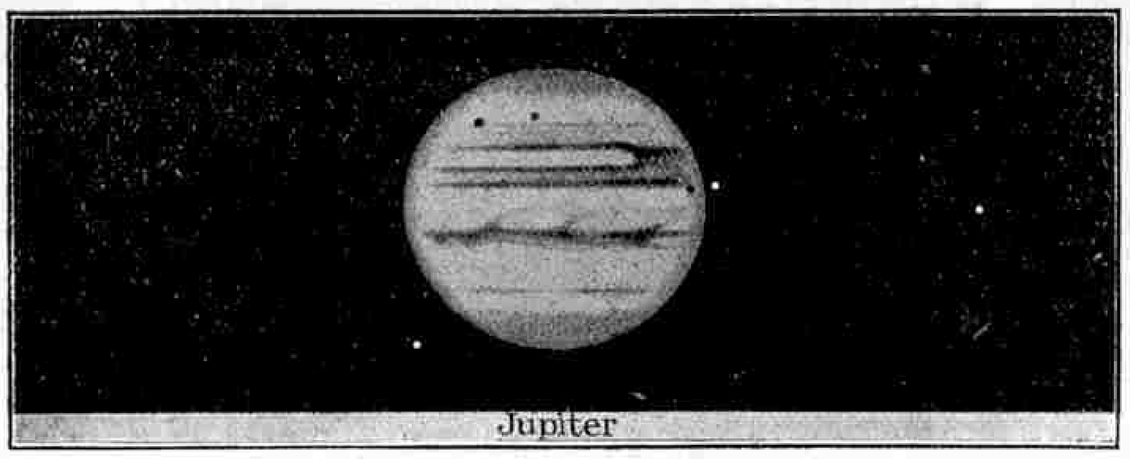
(Published by Chapman & Hall. Price 9/6)

This is another of the "Directly Useful Technical Series"—books intended to occupy a midway position between the theoretical and practical technical books that go to the extreme of the sections dealt with. Although the information contained in these books is of a directly useful character—hence the title of the series—a sufficient amount of scientific explanation is given to satisfy the general enquirer.

The present book is intended to give practical knowledge of the production of structural steel work by up-to-date methods. The various details connected with design, production and costs are considered. There are always two or more ways of doing a job, and it is only by the use of our brains that the easier or the better way is thought out. Those of our readers who are now engaged in a study of steel work, or who are intending to become engineers will find this book of the greatest service in this connection.

The subject is dealt with from the commencement—different methods of unloading stock at the works is first dealt with, followed by chapters on planing-machines, section-cutting machines, setting-out, marking off, finishing, sheering and drilling machines, rivets and riveting, compressed air, smithing, bracing, grinding, and assembling.

In his opening chapter the author remarks that the demand for good structural draughtsmen and designers is greater to-day than ever. What the engineering world wants is more specialisation in this branch of the science. We have no doubt that many of our readers will carefully note this requirement for future attention.



The Giant Planet Jupiter, with four of its moons
(From "Half Hours with the Telescope")

"Building the Pacific Railway"

By E. L. Sabin

(Published by Lippincott & Co. Price 12/6)

An account of the construction of America's first railway, between the Missouri and California, cannot but be of interest to readers on both sides of the Atlantic. The story, one of glorious and heroic effort, commences with the beginning of the great idea, and runs through to the day, 10th May 1868, when the Union Pacific and the Central Pacific lines were joined at Promontory Point, Utah, to form the Trans-Continental Railway. The book has been compiled from old records, official and government reports, and from the accounts of a few survivors of the early days.

"A railroad to the Pacific—I would hate to buy a ticket on it for my grandchildren!" said a critic of the scheme. But it could only be a question of time before the project materialised, for anyone who wished to travel from the Atlantic to the Pacific had to choose between a 1,900 miles voyage round the Horn or a 17 days' stage-coach journey between the Missouri River and California. In those days, as "*M.M.*" stamp collectors know, the mail was carried by pony express-riders, letters being written on tissue paper. The charge was one dollar for half-an-ounce and eight days were required for the riders to gallop between the two nearest points to which the railway line extended. Needless to say, there were many exciting adventures en route, particularly with the Indians, and the writer cannot look at a "Pony Express" postage stamp without having his imagination stirred.

Although thirty years were required to plan the 1,800 miles of track, only six years were required to construct it. In fact, it became something of a race and each of the two companies concerned strained every muscle to cover the most ground. As the men got into their stride they laid 2, 5, 7, and even 10 miles of track in a day, and the average worked out at nearly three miles of track a day, which was very high considering the nature of the country through which the railway passed, and the numerous difficulties that had to be overcome every day.

When the track had been laid the troubles of the pioneers were by no means over—in fact, they had only just began! There were, for instance, many fights with the Indians through whose country the railway passed. In the early stages of the work many of the surveyors were killed, stock was damaged, and stations and ranches burned. The track-layers had to sleep under armed-guard, and often went to work with their pick and shovel in one hand and rifle in the other. "We do not want you here. You are scaring away the buffalo" said Chief Red Cloud of the Sioux, and the Indians proceeded to do all possible to drive back the white man from their territory.

In 1867 the Northern Plains' Indians made one last determined effort to stem the tide of civilisation. Then it was that every traveller between Kansas and Colorado over the great Overland Route of the north, every rancher and every passenger in the stage-coaches, had to fight for his life, either behind log walls or from stage coaches or swaying wagons drawn by galloping horses. Of the Sioux attack and of the brave fight of the boy Eddy—who organised the advance and beat the Sioux off—and of many other exciting encounters with the Indians we have not space to mention but must refer our readers to the book itself. At length the Indians became amenable to reason and a treaty was negotiated with the Paiutes, Apaches, and the Shoshones. The Central Pacific promised that if the Indians would take care of the railroad, they would be cared for in the matter of free transport in return. The chiefs received a pass, allowing free travel on any passenger car and their followers were allowed to ride on the freight cars, an arrangement that seemed to be satisfactory to all parties.

"My Friend Toto"

By Cherry Kearton

(Published by Arrowsmith. Price 5/–)

In this book Mr. Cherry Kearton, already well-known as a naturalist and a specialist in filming big game scenes, tells us of the adventures of his chimpanzee Toto, and the story of his journey from the Congo to London. That there is something distinctly attractive about chimpanzees is evident from the fact that there is always a group of spectators at the Chimpanzee House at the Zoo. "Chimps" seem more amiable and more lovable than monkeys in general, and certainly Toto was no exception. Mr. Kearton originally adopted him as a pet to amuse him on lonely evenings in camp, thinking he might get many a good laugh at his antics, as he had smiled at the monkeys of organ grinders. Before the end of the first day, however, Toto had ceased to be merely his pet and had become, instead, his friend. A wonderful understanding between the two resulted. "If I was sad Toto knew it instantly and came to comfort me. If he was frightened he ran like a child to my arms."

Toto learned to do many things, simply by watching and copying, for he was a perfect imitator. The things he did were not in the slightest in the nature of tricks, however. He would hold up a cup to be filled from a tea-pot when he was thirsty, or would brush his hair, for all the world like his master—who wished that he should be "well brought up and should learn in time to wash behind his ears and clean his teeth three times a day!"

Toto was watching his master one morning and directly he got out of his bath Toto got in. The water puzzled him not a little, and at first he could not distinguish between wet and dry. As soon as he was in the bath he picked up a towel and started to use it, but as it got wet he made little progress and it puzzled him to find his face wet after he had rubbed it with the sopping towel! Mr. Kearton gave him a lesson, however, performing each operation very slowly and Toto, anxious to learn to solve the many difficulties in his new life that puzzled him, watched with an expression of extraordinary seriousness. Then he went through the performance again and this time did it almost perfectly, making a lather and washing his face, spluttering uncomfortably meanwhile. Afterwards he took a hair-brush and a mirror and completed his toilet.

It was a long journey from Toto's home in the Congo to his master's home in London, and Toto had many adventures and great fun with the sailors on the voyage. He had a specially interesting time in France when he broke loose on an express travelling 60 miles an hour! By the time the train reached Calais a crowd had collected, for rumours had flown over the telegraph wires that this wonderful chimpanzee was helping to drive the engine!

Of his further adventures I have not space to tell, but I feel sure that every lover of animals will revel in this little book. Before they are half way through it they will wish that they, too, could have known Toto, who, it is certain, would have made firm friends with tens of thousands of our Meccano boys, if he could have had the chance to do so.

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"Chats on Science"

By E. E. Slosson, Ph.D.

(G. Bell & Sons. 6/-)

Dr. Slosson, who is a Director of Science at Washington, has already written several interesting books. In his latest volume he deals with a host of subjects, all of which will interest our readers intensely. Almost "every subject under the sun" claims our attention, including such marvels as Singing Crystals, Extracting Perfumes from Poison Gas, Artificial Silk, Soda-water, How Man Got his Shoes, Advantage of Sunburn, Petrol and Alcohol, Newspaper Science, On Naming Inventions, Solar Energy, Moving the World with Molecules, Sleeping Sickness, Hydrogen at Work, and Relativity.

Toto Loved to be Tickled!

(From "My Friend Toto")

In his Preface, Dr. Slosson tells us that although most people think science a serious and solemn subject it is only so for the pioneers of scientific progress. "Road-making is hard, but joy-riding is not," he says. "Because some people have to study the sciences seriously it is no reason why the rest of us should not chat or joke about them." It is on these lines that he entertains us in his book.

There is a particular type of individual, we are told, who shows marked resentment at the sight of anything new. So strongly marked is this aversion that it becomes a disease, known to medical men as neophobia. A striking case is illustrated in a letter written in March 1825, by Thomas Creevey, when a Bill for the construction of the first railway was introduced into Parliament. This is what he felt about it:—

"I have come to the conclusion that our Ferguson is insane. He quite foamed at the mouth with rage in our Railway Committee, in support of this infernal nuisance, the locomotive Monster, carrying eighty tons of goods, and navigated by a tail of smoke and sulphur, coming thro' every man's grounds. . . . Well—this railway is strangled at last. To-day we had a clear majority in Committee in our favour and the promoters of the Bill withdrew it."

There are 80 "chats," each complete in itself and we have no hesitation in saying that every one will be read with great interest by readers of the "*M.M.*"

"The Red House of Boville"

By H. Elrington

(Nelson. Price 5/– net)

In this story of school life sport takes a very prominent part. It would certainly appear that the author is a "rugger" enthusiast, for several pages of the book are devoted to accounts of matches, and a discussion of the game. Unlike the schools in most stories, the House of Boville apparently lacks a school bully, although the oddity of one or two of the characters certainly makes up for this omission, which is really rather an improvement than otherwise.

Two of the new boys, who arrive at the school at the same time, have the usually interesting and at times highly-amusing, experiences. We should like to have known a little more of the hero of the book, the conclusion being, to a certain extent, a little disappointing. One hopes that the brightness that only seems to be beginning for the hero in the last few chapters, will continue and increase, but his subsequent progress is left to our imagination. We certainly like all the characters better in the latter stages of the story, which seems to be one of those yarns that could well do with a sequel.

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The Southern Railway

By G. E. Mitton

(Published by A. & C. Black Ltd. Price 2/6)

This interesting little book, a companion volume to "The London & North Eastern Railway" reviewed last month, has 92 pages of extremely interesting reading. The illustrations include several small sketches and eight coloured plates, showing various beauty-spots in the south of England.

The book, which is largely given up to a most interesting account of the counties in the south of England and a description of their beauty and history, is an up-to-date guide to the picturesque southern counties. Certainly the illustrations alone would tempt one to visit many of the places through which the Southern Railway runs, but the history of many of the towns, going back as some of them do to the time of King John, makes them doubly interesting. Incidentally it is interesting to note from the first chapter, which includes a history of the Southern Railway, that Waterloo Station, London, is the largest station in Great Britain and covers 24½ acres.

Interesting New Books

We hope to deal with the undermentioned books in an early issue.

"THE WORLD IN THE PAST"
by B. Webster Smith.
(Warne & Co. Ltd.), 10/6 net

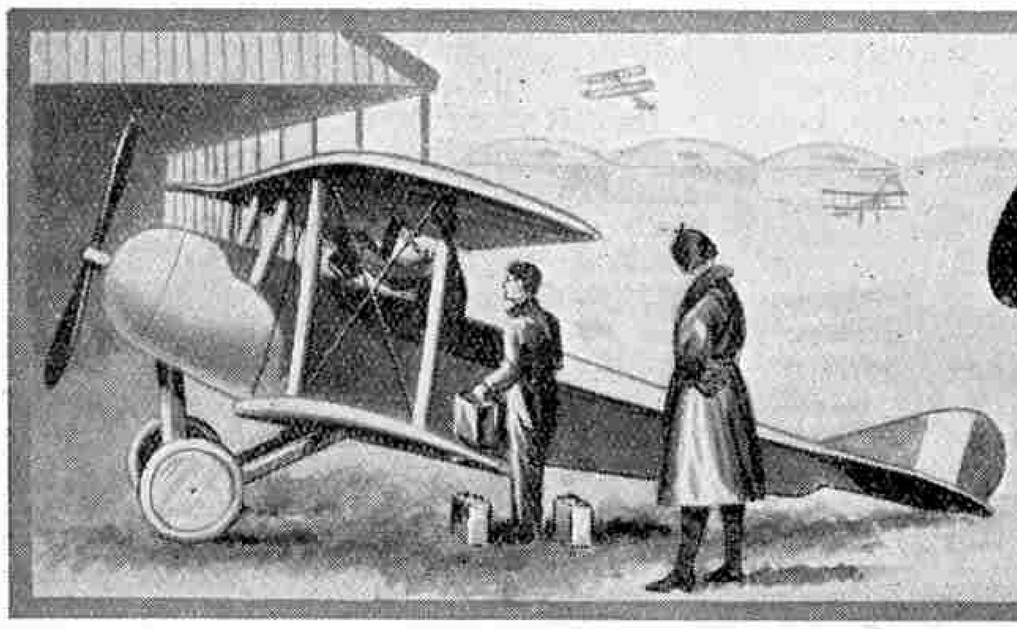
"ADMIRALTY HANDBOOK OF WIRELESS TELEGRAPHY"
(H.M. Stationery Office), 5/– net

"THE ELEMENTARY GUIDE TO REINFORCED CONCRETE"
(Concrete Publications Ltd.), 2/–

"GLIDING AND SOARING FLIGHT"
by B. Weiss
(Sampson Low, Marston & Co. Ltd.), 5/–

"DAVID GOES VOYAGING"
by David Putnam
(G. P. Putnams, Sons Ltd.), 5/– net

"A COMMERCIAL AND HISTORICAL ATLAS OF THE WORLD'S AIRWAYS"
(Francis J. Field Ltd.), Price 2/6 net



Air News of the Month

New Semi-Rigid Airship

A new type of semi-rigid airship of novel design, estimated to cost only £5,000, is being built at Harrow by a newly-formed British company. It is being constructed to designs prepared by Mr. M. Klauck, an Alsatian engineer. Its length will be 234 ft. and it will be capable of carrying 15 passengers to Paris and back in one non-stop trip at a speed of 64 miles an hour.

Hitherto the great factor militating against the use of airships has been the necessity for a large ground party to handle the ship while mooring, but this ship will require only two men for the releasing and mooring operations.

Control while in flight will be exercised by one navigator-pilot and two engineers. The engines will be 240-h.p. Siddeley "Pumas."

The first use for the new airship will be a round of visits to the large provincial cities in connection with an advertising campaign, for which several contracts have already been secured.

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The "*Argosy*"

The first of three huge passenger aeroplanes, incorporating many new features, has just begun flying tests at the Coventry works of Messrs. Armstrong-Whitworth Aircraft Ltd., by whom it was built for Imperial Airways. The machine is the first British air express to embody steel construction in its hull and other parts, and also it is the first machine of its type to be sufficiently large to permit the provision of a navigator's chart-room immediately behind the cockpit of the pilot and engineer.

The new machine, which will be known as the "*Argosy*," is driven by three "Jaguar" engines developing a total of 1,155 h.p. and any two of these will be sufficient to maintain it in flight if one should break down. It will be capable of being navigated safely and accurately on long flights even under unfavourable conditions, the risk of a forced landing being almost eliminated.

These luxurious aeroplanes provide accommodation for 20 passengers in addition to pilot, engineer and navigator, and are scheduled to fly at 100 miles per hour. Their weight when fully loaded will be 7½ tons.

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A Tailless Aeroplane

Speaking recently before the Royal Aeronautical Society, Captain G. T. R. Hill described the tailless aeroplane designed by him and in which successful flights have been made at Farnborough. Capt. Hill claims that his machine conforms more closely with the appearance and structure of the most efficient gliding birds, such as the gulls with their small tails, or the tailless pterodactyls that are said to have been capable of flying several hundred miles at a stretch, than any other machine yet built. His machine is known as the "*Pterodactyl*" on account of its structural resemblance to that species of prehistoric flying lizard.

We intend to describe this interesting machine more fully in next month's issue.

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Cairo to the Cape

The four R.A.F. machines that have been flying, for demonstration purposes, from Cairo to Cape Town, reached their objective safely on 12th April. During the flight across Africa they manœuvred over native territories, engaging in mimic defence battles with native regiments in the British territories.

One machine arrived with a cracked tank streaming with oil. The defect was noticed by the pilot when flying over mountainous country and it was feared that a forced landing would have to be made. The machine struggled to Cape Town, however, and made a faultless landing.

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London to Australia

It is announced that arrangements are being pushed forward in connection with a proposed flight from London to Australia by Mr. Alan Cobham. The Commonwealth Government is affording every possible assistance.

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Air Mail and Parcels

During 1925, nearly 50,000 lb. of parcels and 15,500 lb. of mail were carried from England to the Continent by aeroplane.

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102 m.p.h. on Water

The flying boat "*Widgeon*" was tested at Sydney recently, and averaged over 102 miles an hour on the water.

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The Monotriplane

A giant all-metal aeroplane, the biggest yet attempted, is being constructed in America, and when finished is to be placed on a projected London—New York air service via the Azores. The new machine, which is known as the "Monotriplane," will be 147 ft. long and will be driven by eight Packard engines. The anticipated speed is 150 miles per hour. The design is on entirely new lines and shows three wings, a large one amidships and smaller ones in front and behind. The pilots will be situated in a glass-sided cabin in the forward wing.

The hull is divided into two decks, the upper one containing a kitchen and sleeping quarters, while the lower will accommodate the crew, freight, and mails. The engines are housed inside the wings, four in the main wing and two in each of the smaller ones, and they will all be encased in rubber and asbestos to ensure quietness for the passengers. The machine will be rendered as nearly unsinkable as possible by means of watertight compartments, and will be fitted with a special device to enable it to ride safely on rough seas.

The first of these new craft will be ready for its trial flights early next year, and it is estimated that, with a full load of 50 passengers and crew, the trans-Atlantic journey via Ponta Delgada in the Azores could be completed in less than 18 hours.

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South African Air Mail

We announced recently in these notes that the proposed civil air service between Cape Town and Johannesburg was to be operated by Junkers machines by the German Air Line. We now learn that the proposal has fallen through owing to the German company failing to fulfil the conditions of the agreement within the stipulated period.

The scheme has not been abandoned, however, and an official statement has been made that the Union Government are prepared to consider proposals from any company that is willing to undertake the work.

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The King's Cup

The race for the King's Cup, known as the "Aerial Derby," will take place on the 9th and 10th of this month. It has been decided to replace the double circuit of England by a series of short dashes between various provincial towns and Hendon, to be performed on each of the two days of the race. The towns to be visited are Martlesham, Cambridge, Coventry, Cheltenham and Salisbury, the respective distances from Hendon to each town and back being 144, 90, 160, 170 and 160 miles. The total distance to be flown each day is 724 miles.

This change has been made with the object of providing the spectators at Hendon with a fuller day's sport. Under the old arrangement the machines dribbled into Hendon at long intervals, but the new idea will ensure a steady stream of arriving and departing machines, for each one must land and taxi past the public stands on arrival from one town before starting for the next.

Reserve of Air Force Officers

The Air Ministry announce that vacancies exist in the Reserve of Air Force Officers for candidates to be trained as pilots. Applicants need not have done any previous flying and must be over 18 and under 25 years of age. Those judged from their applications to be suitable will be interviewed and, after passing an examination by the Medical Board, will be gazetted to commissions in the Reserve as pilot officers. The probationary period is 12 months, after which satisfactory officers will be confirmed in rank.

Flying training will be arranged, as far as service requirements allow, at the civil aviation centre that is most convenient to the officer, and will consist of a three months' course (preferably continuous but which may be taken intermittently if necessary) during the first six months of service; six hours' solo flying (to be carried out within a total maximum period of 10 days' training) during the second six months; and 12 hours' solo flying (to be carried out within a total maximum period of 20 days' training) in each subsequent period of 12 months' service.

When undergoing training, or if called up for continuous service in an emergency, an officer of the Reserve receives the same pay and allowances as an officer of the same rank on the active list. In addition, an annual retaining fee of £30 is payable, subject to compliance with the regulations.

The number of commissions under this scheme is strictly limited and the standard required is high. At the present time 16 vacancies only are offered for competition.

Application forms and further details can be obtained from the Secretary, (S.7 Reserves), Air Ministry Adastral House, Kingsway, London, W.C.2.

* * * *

Air Ministry Helicopter Competition

The Air Ministry announce that the period in which machines entered for the helicopter competition were required to pass the prescribed tests ended on the 30th April and the competition is now closed.

Applications to enter machines were received from 34 competitors, but only one competitor actually sent a machine to Farnborough, where the tests were to be carried out. This machine did not carry out any of the tests, however, and consequently none of the prizes offered was won. It has been decided not to renew the competition.

"Moth" Aeroplanes in the Strike

"Moth" aeroplanes played an interesting part during the recent general strike. On the first day of the strike one of the directors of a London newspaper telephoned to the Royal Aero Club at 4.15 p.m. that he wished to get to Manchester that evening. Arrangements were made at once with the London Aeroplane Club at Stag Lane, and at 5.25 the traveller reached there, leaving on a D.H. "Moth" at 5.30. The machine arrived at Woodford Aerodrome at 7.30 p.m., a remarkably quick flight for such a small machine.

On the following morning the pilot of the machine, Mr. Whitcomb, left Woodford carrying parcels of the leaflet produced by a London newspaper in Manchester. Some of these parcels were dropped overboard at various towns along the route, without alighting, and the pilot brought his machine back to London by noon on the Wednesday carrying the last parcel of the leaflets for Londoners.

* * * *

Across Everest by Aeroplane

M. Callizo, the holder of the present world's altitude record referred to in another paragraph, is to attempt a flight across Mount Everest during the summer. He proposes to use a specially-equipped Bleriot-Spad machine and film records of the flight are to be made. It will be a thrilling experience, to say the least of it.

Trans-Atlantic Air Race

Arrangements are being made for a non-stop race from New York to Paris, a distance of 3,740 miles, for a prize of £5,000. The race will take place this year when weather conditions are suitable, probably in August, and at present machines representing America and France have been entered. A German machine is to be entered and other nations are considering the desirability of competing.

In order that full advantage may be taken of weather conditions, arrangements have been made for the machines to take on board the huge quantities of fuel necessary for a sustained flight of such a length and to stand in readiness to ascend at a moment's notice, when reports from ocean liners indicate that the time is ripe. The progress of the competitors will be reported by wireless and will be known from hour to hour.

M. Fonck, the famous French airman, is at present testing a giant machine specially designed for this flight, and Lieut.-Commander Davies, representing America, is also working on another "mystery" machine. The only information yet available concerning the proposed German entry is that the machine may be an all-metal monoplane.

It is anticipated that the flight from New York to Paris, assuming that favouring wind currents prevail, will take not more than 30 hours. In this connection it will be remembered that Sir John Alcock and Sir Arthur Whitten-Brown, the British airmen who were the first to make a non-stop trans-Atlantic crossing by air, accomplished the 1,890 miles crossing from Newfoundland to Ireland in 16 hours 12 minutes, being greatly assisted by the weather conditions.

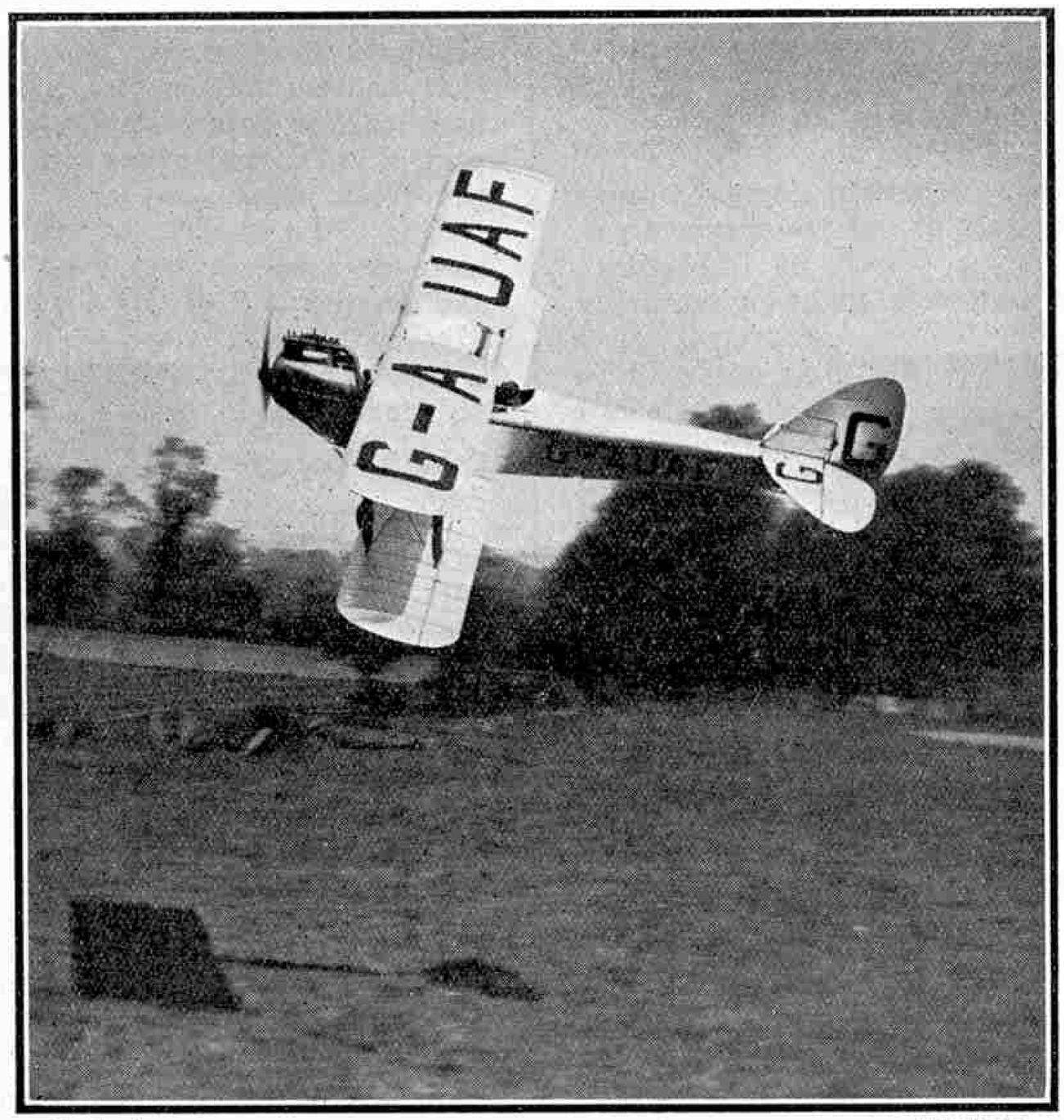
* * * *

More R.33 Experiments

Following the successful launching of light aeroplanes from a trapeze-like apparatus suspended beneath the airship R.33, as described in our February issue, attempts are to be made shortly with an improved apparatus and a more powerful aeroplane of the "Grebe" type fitted with a 400 h.p. engine.

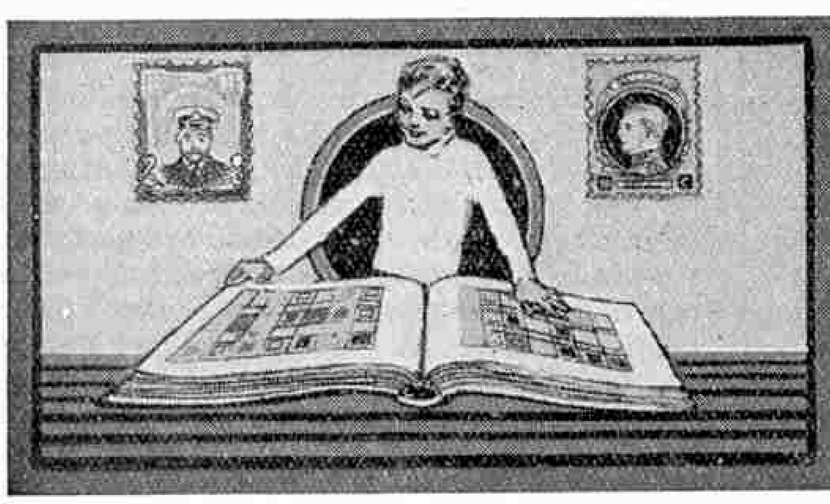
These experiments should provide a very exhaustive test and, if successful, there would appear to be no further reason to doubt the practicability of employing big airships as travelling bases for fighting machines in war-time. The subject was fully dealt with in a special article in our issue for February last.

Rounding the Turning Point



Courtesy] ["*Flight*"

A de Havilland "Moth" banking steeply on the turn



Stamp Collecting

MAKERS OF THE BRITISH EMPIRE: 1. OUR AMERICAN POSSESSIONS

By R. Kay Gresswell

We tracked the winds of the world to the steps of their very thrones;
The secret parts of the world were salted with our bones;
Till now the name of names, England, the name of might,
Flames from the austral bounds to the ends of the boreal night.
—W. E. HENLEY.

ALTHOUGH the majority of British colonial stamps rightly bear the portrait of our sovereign, those showing some scene or person of importance in the growth of the colony concerned make an extremely interesting group. Newfoundland is the oldest British over-sea dominion that still remains in our possession. The stamps of this country, issued in 1897, the 400th anniversary of the discovery of the island, and in 1910, the 300th anniversary of the granting by King James I. of England of a charter for a plantation, show portraits and views relating to its discovery and to its colonization.

James I.

The 2 cents value of the 1897 issue illustrated in the next column shows the portrait of John Cabot, or, more correctly, in its native form, of Giovanni Caboto, the discoverer of North America. Cabot was born in Genoa in 1450 and when eleven years old he went to Venice. Here he lived until he was about thirty-five when he removed with his family to London. His occupation was that of navigator and once when paying a visit to Mecca he saw the great trade that was done there in goods brought overland from the far distant parts of eastern Asia, Japan and China. Knowing that the shape of the Earth was a sphere, it seemed to him that this part of Asia could be reached more easily by western Europeans by proceeding westward across the Atlantic Ocean to Asia, for the existence of the American continents was then unknown.

He was so certain that Asia could be reached across the Atlantic in this way that he decided that as soon as possible he would set out on a voyage of discovery in that direction.

When he came to England his plans became known to some merchants in Bristol and it was decided that attempts should be made at once, for if Cabot's theory should prove to be correct it would make Bristol the greatest market in the world. Several unsuccessful attempts were made, but in 1493 it became known that another native of Genoa, Christopher Columbus, had reached some islands believed to be the eastern part of India and which had been named by Columbus the West Indies.

This had the effect of making Cabot and his friends more determined than ever to reach the east of Asia and on the 2nd of May, 1497, in a ship called "*The Mathew*" and with a crew of only eighteen men, he set sail from Bristol.

Cabot's Voyages of Discovery

John Cabot

After an adventurous voyage he reached the northern part of Cape Breton Island on the 24th of June, having sailed a few miles to far south to sight and so discover Newfoundland. Cabot took possession of the land on behalf of King Henry VII., being confident that he had arrived at the north-east coast of Asia. Sailing for home with the great news Cabot sighted the south-western extremity of Newfoundland and named it Cape Ray. Sailing along the south coast he discovered and named St. Pierre and Miquelon (two islands now French possessions) and left the Newfoundland coast at Cape Race.

On another voyage Cabot explored part of the coast of Greenland, Baffin Land, and sailed down the Canadian coast in an endeavour to find Japan, for he still believed and continued to believe all his life that he was exploring the north-eastern corner of Asia. On this voyage he mistook Belle Isle Strait, which separates Newfoundland from the mainland, for a bay, and sailing down the east coast of Newfoundland he saw Cape Bonavista, pictured on the 3 cents value of the 1897 series. It is believed by some that this cape was the first land sighted by Cabot on his 1497 voyage, but there would seem to be more satisfactory evidence in favour of the accuracy of the account we have already given, in which he discovered the south coast of Newfoundland on his return towards home.

The 1910 series of stamps shows a portrait on the 1c. (illustrated here) of King James I. of England who granted to John Guy (whose portrait appears on the 3c.) permission to colonize the island of Newfoundland.

Guy sailed in the "*Endeavour*" (4c.), but his scheme for settlement met with only slight success. The 6c. value of the same series shows Lord Bacon, "the guiding spirit in colonization scheme" and the 2c., illustrated here, shows "the arms of the London and Bristol Company for Colonizing Newfoundland."

Cartier and the St. Lawrence

After Cabot came the Frenchman, Jacques Cartier, a native of St. Malo, Brittany, born in 1491, six years before Cabot's first voyage. We know nothing of his life until he was sent on 20th April, 1534, by the French to discover a north-west passage to the East owing to the trade with Brazil having been suppressed and it having been discovered that America was a new continent and not the eastern end of Asia. In three weeks Cartier reached Newfoundland and sailed into Belle Isle Strait, which was still thought to be a bay, being then known as the Bay of Castles.

Discovering that the western coast of the supposed bay was barren and rocky, Cartier sailed down the west coast of Newfoundland (that is, the east coast of the "bay") in search of its southern side. When near the southern corner of the island a storm drove the ship westward and in this way Cartier accidentally discovered Magdalen and Prince Edward Islands, which he mistook for the mainland, and the island of Anticosti, which he also thought was joined southwards to the mainland. Passing up the east coast of this island he discovered the passage along its northern side, but owing to the time of the year it was decided to defer exploring this possible route to Asia until the next voyage.

In the following year Cartier reached this same place and then named it the Bay of St. Lawrence, a name that is now applied to the whole gulf and to the river that has made it. Proceeding up the river St. Lawrence, he passed the mouth of the Saguenay river, reached and named the island of Orleans, and was told by two Indians whom he had captured on the previous voyage that he was now in the country of Canada, this being really their name for "village."

Cartier proceeded up the river as far as the point where Montreal now stands and his ships passing Quebec are shown on the 20 cents value of the Canadian series of stamps issued in 1908. On his return journey towards home, Cartier passed south of Anticosti, thus discovering that it was an island. He entered the Atlantic through the Cabot Strait between Newfoundland and Cape Breton Island and reached France on the 16th July, 1537.

Champlain continues Cartier's Work

Nearly seventy years later another important man figured in the discovery and colonization of Canada. He was Samuel de Champlain, born at a small French port on the Bay of Biscay in 1567, the son of a sea captain. He was trained early in his boyhood in seamanship and navigation but after a while he entered the army of Henry IV. and remained in it until it was disbanded. At that time his uncle had charge of some ships under the French government and Champlain secured command of a vessel that had been ordered to sail to the West Indies.

This was in 1599, when he was thirty-two years old, and on this voyage, which lasted two years, he visited many of the coasts of the islands of the West Indies and of the neighbouring mainland. He landed at Vera Cruz and visited the city of Mexico.

It is interesting to notice that his account of this voyage contains a suggestion for a canal across the isthmus to join the Atlantic and Pacific Oceans thus shortening the voyage to the South Seas.

Champlain now remained a navigator and in 1603 made his first visit to Canada, when he explored the river St. Lawrence to the rapids above Montreal that were the furthest point reached by Cartier. In the following year after having returned to France he explored the coast of the new continent southward from the St. Lawrence to Cape Cod, just south of the site where now stands the city of Boston.

The navigator again returned to France owing to trouble with the Basques and Bretons who had persuaded the French king to revoke the patent he had conferred upon Pierre de Guast, sieur de Monts, Champlain's patron, giving him permission to explore and to colonize the land.

The patent was, however, re-granted shortly afterwards in a new form and Champlain persuaded de Monts to confine his attention to settling on the St. Lawrence. Two ships were sent out, one under the command of Champlain, who was to explore and colonize, while the other traded in order to pay the expenses of the expedition.

The White Settlement and Quebec

Champlain fixed the site of Quebec, gave it its name, and founded the first white settlement there in July 1608, in commemoration of which Canada issued on the 16th of July, 1908, the Quebec Tercentenary series of stamps already mentioned. Champlain is shown on the 1c., illustrated on this page, his house at Quebec appears on the 5c., also illustrated, and his departure for the west appears on the 15c. value.

In the following year Champlain aided the Algonquin and Huron Indians in their fighting against the Iroquois who turned to the Dutch and English for assistance against this white enemy. It was partly on account of this that the English and French fought one another for possession of Canada. In 1611 Champlain founded Mont Royal, which became Montreal, and he continued to colonize the land and to fight with Indians against Indians.

After 1615, however, he ceased his wanderings and determined to settle down at Quebec and spend his time

(*Continued on page* 445)

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Franciscan Centenary

Italian Commemorative Issue

In the year 1181 or 1182 at Assisi, a town of Italy about fifteen miles south east of Perugia on the river Tiber in the midst of the Apennines, one Francesco Bernardone was born. His father

was a prosperous merchant of the town and at the time of his son's birth was in France, hence the baby's name of Francesco.

The early life of this boy proceeded in the usual way and in his youth he became the leader of the young men of the town. When he was about twenty, however, he was prostrated by a long and serious illness. During the interminable lonely hours that he was compelled to spend in idleness he had time to think of his life and to realize that something more than mere gaiety is to be sought. He became extremely dissatisfied with his old life and when he recovered he set out on a military expedition. He fell ill, however, on the first day and had to return home.

He now partly resumed his old life but soon tired of it again, and he began to devote himself to helping the poor, and to spend considerable time in prayer. He went to Rome and while there exchanged clothes with a beggar. He found great happiness in being dressed in this way and in having no belongings, and when he returned to Assisi he continued to live in extreme poverty, begging his subsistence. This greatly enraged his father, who disinherited him, thus enabling Francis (as he was now called) to spend his whole time preaching, praying, helping the poor and tending the lepers in the neighbourhood.

We are told that the final decision of Francis to devote himself to a life of service was brought about by a visit to the little ruined Chapel of St. Damian near Assisi. While praying there Francis beheld a vision in which the Christ above the altar accepted him as His servant.

From this time onward the life of Francis becomes shrouded in an atmosphere of miracles, and it is extremely difficult to disentangle fact from legend. Perhaps the most outstanding feature of his character was his passionate love for living creatures of all kinds, and there is little doubt that he had an extraordinary influence over the birds and beasts of the field.

He began to attract followers and eventually out of these small beginnings there grew up the great religious order of Franciscans. This order first spread over the district around Assisi, then over the whole of Italy, and eventually over the whole of Europe. During the Reformation there were nearly one hundred thousand Friars Minor and at the present time there are about 26,000 Franciscan friars. It is interesting to notice that Friar Roger Bacon was a Franciscan.

Francis died on the 3rd of October 1226 and two years later he was canonized. To commemorate the seven hundredth anniversary of his death, which falls this year, Italy has issued a series of five stamps all of which we illustrate. The 20c., pale green, shows Francis' vision of the three Crosses over Jerusalem. This vision was one of the causes of the change in his mode of living during his youth. This value, together with the 40c. and 60c., was typographed from woodcuts made by Blasi to, in this case, the design of Duilio Cambellotti. The 40c., deep violet, shows the Church and Monastery of St. Damian, towards the restoration of which Francis gave so much money that this was the chief cause of his father disinheriting him. This value was designed by Francesco Blasi.

The 60c., lake, designed by E. Del Neri, shows the huge Franciscan temple at Assisi begun shortly after the death of Francis. The two remaining values, 1.25 lire, blue, and 5 lire plus 2.50 lire, deep brown, were engraved by A. Repettati, the former being designed by Aldo Rizzini and the latter by Giovanni Guerrini. The 1.25 lire shows the death of Francis surrounded by followers, and the highest value a three-quarter length portrait of himself copied from the painting now in the Church of S. Maria degli Angeli, Assisi, by Luca della Robbia. The whole series was printed by the Officina Carte e Valori.

Makers of the British Empire—

(*Continued from page* 443)

in strengthening and spreading the settlement. These French possessions were nevertheless very weakly held and in 1629 Quebec was captured by three British ships under Sir David Kirke and Champlain was taken prisoner to England. He was released four years later when France regained Canada and he returned to Quebec where he died on Christmas Day, 1635.

The Battle on the Plains of Abraham

Canada was, therefore, still a French possession and it was not until the famous battle of the Plains of Abraham in 1759 that it became definitely and permanently British. The story of this battle, in which the leaders of both sides were killed, forms one of the stirring stories in the fighting history of the British Empire and although already well-known is still worth repeating here.

General Montcalm with his French soldiers was holding Quebec and Major-General James Wolfe, a young man of thirty-three, in command of about 7,000 British soldiers was ordered to attack and if possible to capture the city. He was convoyed by a fleet of British naval vessels to the Isle of Orleans in the middle of the river St. Lawrence opposite to Quebec.

The city itself stands at the junction of the river St. Charles and the St. Lawrence and the banks of the rivers are high and precipitous. The city is in the shape of a triangle and was thus protected on two sides by the rivers and cliffs, while on the third side were the so-called plains of Abraham, to which it was believed there was no approach from the river owing to the cliffs.

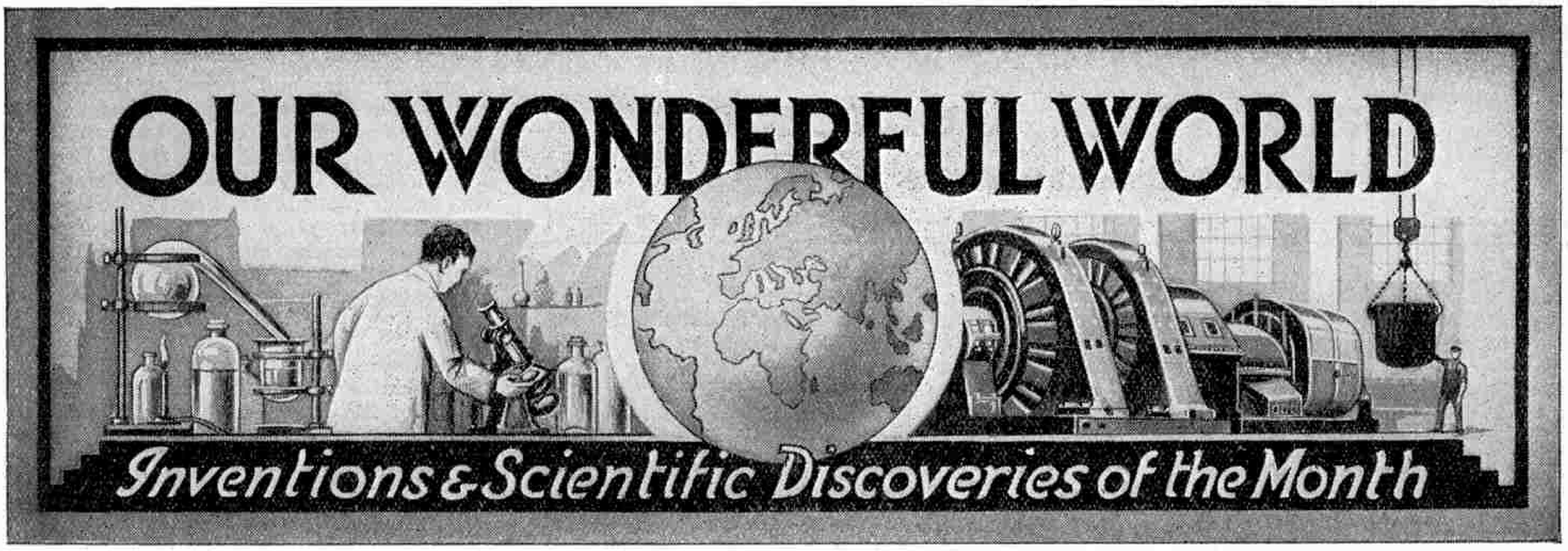
Wolfe first endeavoured to bombard the city from the river but this proved ineffectual owing to the distance. Next he decided to fight his way to the city via the St. Charles river. An attack was made on 31st July but was defeated with heavy losses as a result of the disappointment of which Wolfe's health broke down.

The Taking of Quebec

After some weeks, however, Wolfe recovered a little and it was discovered that the cliffs could be climbed some distance up the river by a tiny path in a little cove. The ships containing his men sailed up the river beyond the point so as to act as a decoy and at 1 a.m. on the 13th of September 1759 Wolfe and half his men set out from these ships in small boats and, drifting with the ebb tide, landed in the cove. They climbed the difficult path as best they could and by morning they were ready on the plain. There was only infantry since the cavalry and guns could not be brought up the precipitous path.

The French seeing that a dangerous attack was being made hurriedly gathered their troops together and marched out under Montcalm and came towards Wolfe's men, shooting as they approached. The British remained motionless and did not return a single shot until, when the command was given, every trigger was pulled at the same moment, sending one volley from the whole line.

This sudden attack so upset the French soldiers that the battle was practically won and five days later Quebec surrendered and Canada became a colony of which England is proud. But Montcalm and Wolfe were both killed.



Ancient Chemical "Code-Names"

It is interesting to know that the early alchemists of Persia, Greece, Arabia, etc. used what may be termed "Code-names" for their various elements and compounds. Instead of using ordinary names, they gave their chemicals secret names. Reading in ancient writings of "the Scribe" one imagines a reference to a learned old man writing letters for his less educated brethren, but this is not the meaning of the word for among the alchemists "the Scribe" was the name for Mercury, which was sometimes also referred to as "the Volatile Slave." "The Flying Salt" was the name given to ammonium chloride or sal-ammoniac, whilst copper was known as "The Green One."

* * * *

Bad News for Burglars!

An interesting demonstration of the relative values of various "burglar-proof" steels and alloys was given recently at Dayton, Ohio. The demonstration was held in support of the claim of the inventor of a new heat-resisting steel, known as "Donsteel," that it is impossible for any burglar to penetrate his metal. All known methods of safebreaking, from drilling to the oxy-acetylene torch, were tried on chrome steel, and alloys of steel and copper and steel and carborundum. In each case the steel yielded quickly to the tremendous heat.

Independent experts then attacked the new steel with oxy-acetylene torches, but even after two hours' work failed to make any impression upon the plate. It is claimed that the new steel will provide an impregnable strong room if used in conjunction with reinforced concrete.

* * * *

Camera as Compositor

Photography as a science has been used by practically every industry in existence but it is probable that none owes so much to it as printing and publishing. It is therefore fitting that a recent photographic invention should be such as to indicate a probable revolution in compositors' methods. By this new device the use of metal type is eliminated and in its place a photographic film is used. A key board, very similar to a typewriter in operation, projects letters and characters from a master film on to the photographic film which, after development, corresponds with the ordinary set-up type. In other words, it bears photographs of the matter to be printed. Printing may then be done by direct litho, line block for ordinary letterpress, or by photographic processes from either plate or stone.

Helium from the Air

The British Oxygen Company claim to have succeeded in extracting helium from the air at their North Wembley works, and although regarded as a by-product, the gas is 95 per cent. pure. The machinery used is of a secret type and the nature of the actual process is also a closely guarded secret. Except for the inflation of airships the uses of helium are at present few, but recently it has been employed in diving operations. A mixture of helium and oxygen is preferable to air for breathing at great depths, while danger from what is known as "caisson sickness" is less serious.

Helium is believed to be the one non-inflammable gas available for inflation of airships, and it is claimed that, but for this property of the gas, there probably would have been a total loss of life as a direct result of the explosion on the American airship PC. 4.

* * * *

A Strange Find in a Tree

We have heard of trees in which have been found embedded axe-heads and even, in at least one case, jewellery, but a unique find has been made at the London Midland and Scottish Railway's carriage and wagon works at Wolverton.

Workmen were sawing an elm into planks when they struck metal, and it was found that a complete sickle was embedded in the heart of the tree. The age of a tree can be told, of course, by the rings in the wood, and from these it would appear that the sickle was left in the tree some seventy years ago. The tree was grown in Bedfordshire and it is probable that some woodman left the sickle in the tree and was later called away hurriedly and forgot the tool, which has now come to light in this strange manner.

* * * *

Washing Print From Newspapers

The publishing world has received with considerable interest the announcement of the invention of a successful process for removing the ink from old newspapers, so that they may be turned back into newsprint and used again. The inventor, Professor Rhodes of Cornell University, claims that the paper resulting from the purification is in no way inferior to the original article.

The effect of various cleansing agents for removal of the ink has been tested and at least two have been found that will make the paper as white as the original. The process effects no marked change in the nature of the pulp, but there is a loss of about 10 per cent. on its bulk.

The Organ-Piano

An invention that will be of considerable interest to our musical readers is one that practically converts the tones of a piano into those of a pipe organ. Recently it was demonstrated to a number of eminent musicians, who declared it to be the most remarkable advance in piano construction since the instrument was first invented. Ordinarily, no matter how strongly the keys of a piano are struck, the sound fades gradually into silence, but the present invention permits the pianist to control the tones, letting them die away or grow in volume as he wishes, by means of reflectors placed inside the piano and controlled by a fourth pedal. The reflectors, which are simply parallel revolving slats, open according to the extent of the pedal action; the heavier the pedal action, the wider will be the opening. The action of the opening reflectors causes the tones to rebound to the sounding board, the volume and tone depending upon the angle at which the pedal sets the reflectors.

The fourth pedal is used just as are the normal expression pedals and it is stated that wonderful volumes of sound and variations of tonal light and shade can be obtained. The appearance of an instrument embodying this invention is very little different from that of the ordinary piano, the only difference being its somewhat deeper case.

* * * *

Lithium in Manitoba

Hitherto the Province of Quebec has been the only source in the British Empire from which lithium bearing minerals could be obtained in such quantities as to make development of the deposits a practicable commercial proposition. Recently a valuable new deposit of this class of mineral has been found in Manitoba at Point Du Vois, south of the Winnipeg River. At least 5,000 tons of material are available and as transport facilities are good, it is probable that a new industry of considerable importance will spring up in the Province in the near future.

* * * *

New German Metal

A company has been formed in Sweden, with the aid of German capital, to develop the invention of a German engineer consisting of an exceedingly hard metal to be used in the manufacture of grinding and other tools. The metal is produced by an electro-mechanical process and is said to retain its qualities even when heated to a temperature of 3,000°C.

A Deep-Sea Camera

The mysteries of submarine life are gradually being dispelled, and yet more secrets probably will be revealed by a wonderful new camera that has been constructed specially for work below sea level.

This submarine camera consists principally of a steel cylinder, 32 in. in diameter, provided with seating accommodation for an operator who will make observations through small portholes closed with heavy lenses. Constant communication with assistants at the surface is provided by telephone.

Above the steel cylinder a specially constructed projector will project a powerful flood light on to the objects to be studied and photographed. An artificial screen to serve as a background, will be created by filtering chemicals through the water. This screen will also reflect the light rays that otherwise would be dissolved in the gloom of the water.

Below the main cylinder a shorter magnetically locked tube containing storage batteries is suspended and weighted to overcome the buoyancy of the entire structure, causing it to sink. In an emergency the operator could release and drop this tank, thus enabling the remainder of the apparatus to rise to the surface and safety.

The camera, which can take either still or motion pictures, is enclosed in a small watertight covering and can be moved up and down by means of an electric motor and gear. The occupant of the diving cylinder is able to turn the camera in any direction or to any angle desired. There is practically no pressure on the operator, who controls all parts of the machine with electric switches and push buttons. Air is constantly renewed while impurities are absorbed by a special device, and the interior of the chamber is warmed by an electric heater.

* * * *

Tobacco Growing

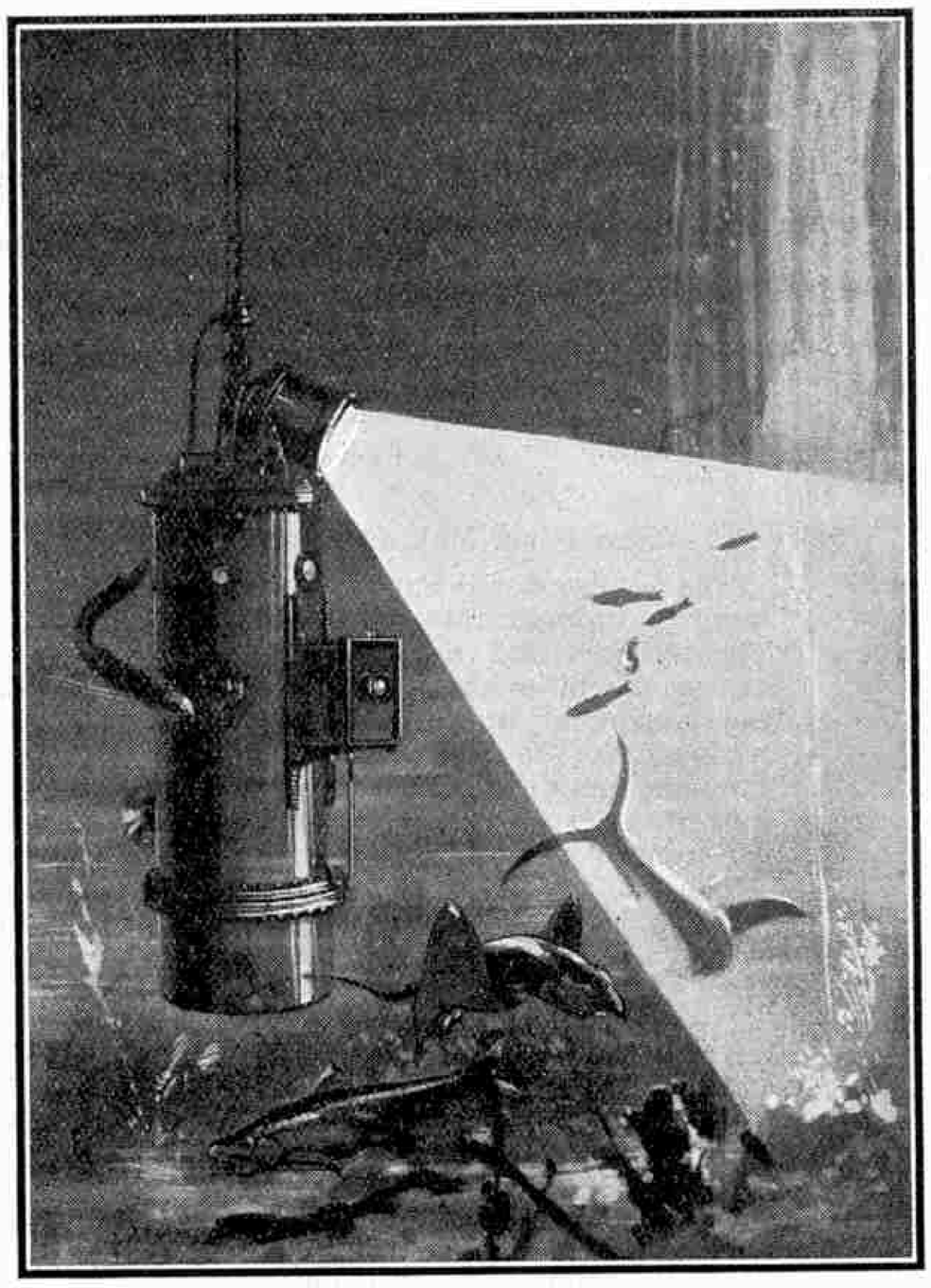
It is wonderful how little the average smoker really knows of the actual cultivation of tobacco and the many varieties there are of this plant. As a matter of fact there are actually about forty different grades of tobacco, from each of which springs a number of varieties.

The countries most suited to the growing of this plant are those in which the temperature is not lower than 40° Fahr. and which are not subject to autumn frosts, and the plants grow to the greatest perfection in the dry climate of tropical countries.

The seeds of the tobacco-plant are very small and there are as many as 300,000 to the ounce! Of this number, however, only a comparatively small number germinate and it is reckoned that only 35,000 in every 300,000 actually produce plants.

Tobaccos vary in the amount of nicotine they contain, the average tobacco containing from 2 to 3 per cent., Virginian contains 3 to 3.5 per cent., whilst Kentucky has the comparatively large percentage of 4.5 per cent. Plants reared in dark rich soil burn badly, whilst those grown in a light sandy soil burn much better.

The process of fermentation, during which the leaves turn from their natural green to the familiar brown shade, is a very important one, since it plays a large part in determining the aroma and shade of the tobacco. In the method generally employed, that known as bulk fermentation, the leaves are graded according to texture and are then stacked in a room heated by steam. Fermentation soon takes place and is denoted by a rise in the temperature. After fermentation the tobacco is again graded and packed but is kept in stock for a long period, varying from two to four years in order to age, before it is sent out for distribution.



The Deep-Sea Camera described on this page

A New Alloy

German scientists have perfected a new alloy to which they have given the name Lautal. The alloy is claimed to be particularly effective in its resistance to sea-water and other corrosives—a fact that should render it particularly valuable for marine purposes, ships, seaplanes, etc. It is composed of about 93 per cent. aluminium, the remaining percentage being silicon and copper and a small amount of iron.

Lautal cannot be worked until it has undergone the requisite heat or other work treatment, after which it does not lose its hardness with time, as do some metals. It can be machined, forged and drawn with ease and has a normal hardness of about 92 on the Brinell scale, which can be increased by suitable treatment.

The tensile strength of Lautal is 24 to 27 tons per sq. in., and the elongation from 18 to 23 per cent., in which respect its properties approach mild steel. It is possible to obtain a tensile strength up to 38 tons per sq. in. by suitable heat and work treatment, but in this case the ductility is much less, the elongation being of 4 per cent.

A Gun that Saves Life

A line-throwing gun, manufactured by the B.S.A. Company, has recently been exhibited. This invention is intended for the same type of work as that performed by the old-fashioned rocket gun, but it affords a considerably higher degree of accuracy of aim. In appearance it resembles an ordinary sporting gun, over the single barrel of which a canister is fixed. This canister contains the line to be thrown.

A long rod is thrust down the muzzle of the gun and attached to the rod is a tube enveloping the end of the barrel. The rod is the projectile and is discharged by an explosive contained in a special cartridge. When it is necessary to throw the line, a cardboard tube, which forms the core around which the line is coiled, is pulled out and the end of the line attached to a bridle on the projectile rod.

The gun is fired in the usual manner from the shoulder, but may be adapted to work on a swivelling stand with a recoil action. The range from the shoulder, using a $\frac{3}{16}$ in. line, is 70 yards, and from the stand 100 yards, while the actual weights of the gun complete with line and projectile are $22\frac{1}{4}$ lb. and 40 lb. respectively.

A $\frac{3}{16}$ in. line, which has a breaking strain of 400 lb., is of itself of considerable use, or it may be used as a means of hauling a heavier rope to carry out the actual work on hand. Apart from service with life-saving apparatus, this new gun possesses a large number of varied uses of which throwing mooring ropes ashore is only one instance.

* * * *

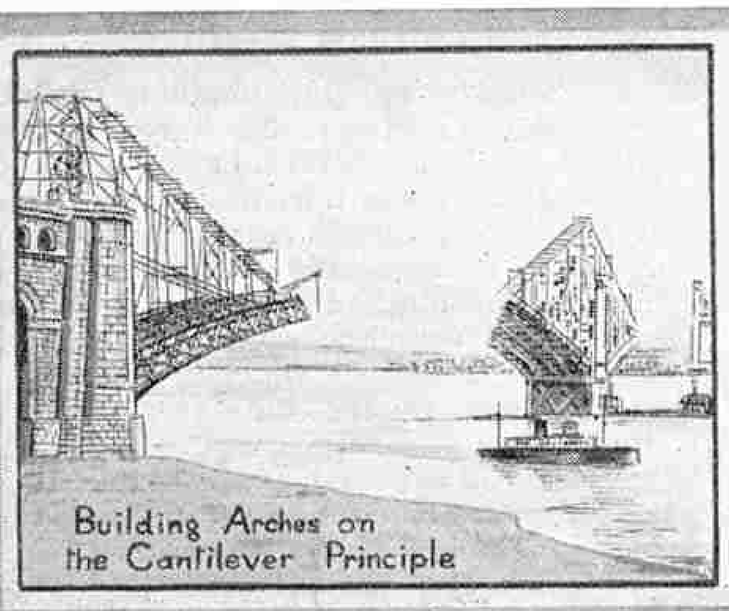
"Motionless" Running Machinery

The famous Seguin Brothers of Paris, who will be remembered for their production of the Gnome rotary motor, have invented a remarkable instrument called the "stroboscope." It is to be used to study the exact action of moving machinery.

The Seguin instrument, which was demonstrated to the French Academy of Science recently by M. Georges Claude, embodies a tube of neon, the light from which can be projected from the instrument at regular intervals upon the object to be examined. A property of the neon lamp is that it can be lighted and extinguished with great rapidity, without any afterglow.

If the rate at which the light is projected be adjusted to the periodic motion of the machinery under examination—such as a propeller or belt-driven pulley—the moving part will appear to be standing motionless. If the rate of the periodic ray projection is adjusted so as to be slightly out of synchronisation, the machinery will appear to be moving slowly and a slow-motion kinematograph view will be obtained. Because the neon light is totally different in quality from ordinary daylight, the instrument may be used in any state or kind of lighting.

In the recent demonstration an aeroplane propeller was used and unsuspected reactions at various speeds were detected. With such an instrument as this, the inspection of the condition of all the pulleys in a factory, without stopping the machinery, becomes an easy possibility.



Engineering News of the Month

A Practical Holiday

As a result of the success of the scheme in previous years, the White Star Line has again arranged for a number of Liverpool University engineering students to sail on board the liners during the summer months, to obtain practical experience. About 24 students will make the Atlantic voyage, on either the New York or the Canadian route, one student to a ship, and each will take watch with experienced marine engineers, assisting in the running of engines and boilers and certain auxiliaries, and also taking part in the overhaul of deck machinery. Hitherto most students during vacation have gone into works ashore, but the White Star scheme has proved of inestimable value in that it gives the student knowledge that never could be gained ashore.

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Meat Shipments.

The importance of Liverpool as a food transport centre will be appreciated when it is stated that in one week recently there were landed 1,414 cattle, 75,290 carcases of sheep and lamb, 20,811 boxes of meat and 60,277 quarters of beef.

* * * *

Britain's Motor Fleet

Some interesting figures issued recently by the Automobile Association show that Great Britain has the largest motor fleet in the world in relation to its area. At the beginning of May there were 640,000 motor cars, exclusive of public service vehicles, 600,000 motor cycles and 230,000 motor vans and lorries.

It is estimated that the private vehicles could carry nearly 12,000,000 passengers over a distance of ten miles within four hours, travelling at a speed of ten miles per hour. In the same time the goods vehicles could transport 3,000,000 tons of merchandise over the same distance.

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The new Citroen Motor works at Slough are estimated to turn out 1,500 cars this year, 30,000 next year and 60,000 in 1928.

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Thirty-Six Days of Storm

A party of seamen from Hull, under the command of Capt. T. Smith, recently spent thirty-six exciting days while taking a new steamer to Canada. They started out from Hull with the S.S. "*John S. Pillsbury*," 1,126 tons, built by Messrs. Earle & Co., of Hull, for work on the Canadian Lakes. After coaling at Grangemouth they proceeded into the Atlantic, where they immediately ran into dirty weather. During the whole voyage across they experienced high seas and buffeting winds, and for a period of six days they were locked in ice. Captain Smith stated that it was the most stormy experience of a long career at sea, the only respite they had being when they put into Louisburg, N.S. for bunkers and stores. Several of the crew lost their effects through the decks being constantly awash. The ship arrived structurally sound, however, and minus only a few lifeboats that had been blown away by the gales.

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New Paper-Making Machine

The International Paper Company have recently brought into operation at their Three Rivers Mill. near Quebec, the first of four machines that will give the mill—the largest of its kind in the world—a capacity of over 700 tons of paper a day. The machine during its first run made ten tons of "newsprint" at a speed of 800 ft. per minute without a single break.

The production of the mill will be equal to 4,000,000 twenty-four page newspapers a day, sufficient completely to cover two acres of ground per minute!

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Lochaber Electric Power Scheme

Considerable progress is being made in the British Aluminium Company's Lochaber hydro-electric scheme which, when completed, will yield between 70,000 and 75,000 h.p. continuously. The scheme draws its water supply from an area of over 300 square miles in the Western Islands of Scotland.

An interesting feature of the work now in hand is the extraordinarily large amount of preliminary construction that has had to be carried out to afford easy access to different portions of the works. It has been necessary to construct a railway 27 miles in length and this has involved the building of 100 bridges and over 350 culverts. A temporary power station developing 4,500 h.p. has been erected and this will supply the power for the rock-drilling machinery that will be engaged on the principal work in the main scheme. This includes the driving of the main tunnel, running from Loch Treig to Fort William, 15 miles in length and 16 ft. in diameter. Work on this tunnel, which is believed to be the largest of its type in the world, has been commenced.

* * * *

Trolley Buses for Ipswich

The Ipswich Corporation are replacing by trolley buses certain sections of the existing street tramways. The buses are of the single-deck saloon type and are designed to be operated entirely by the driver, who receives the fares and issues tickets to the passengers. This is facilitated by a door placed immediately alongside the driver's seat. If desired the buses may be used also in the ordinary way with a conductor, in which case passengers will board the bus by the rear entrance.

A feature of special interest is that the foot brake is operated by compressed air, a reservoir of which is maintained by an automatic compressor at a pressure of 40 lb. Either the foot brake or the powerful hand brake will bring the bus to a standstill in from 16 to 20 yds. when travelling at a speed of 20 miles per hour.

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New C.P.R. Steamers

At the recent annual meeting of the Canadian Pacific Railway Company at Montreal it was decided to build seven new steamers for the company's ocean services. The number is made up of two passenger vessels of 18,000 tons displacement and measuring 580 ft. in length, and five cargo boats of 8,500 tons displacement and 410 ft. in length. The projected speed of the passenger vessels is 17½ knots and of the cargo boats 14 knots. It is probable that the ships will be built in Great Britain, the approximate cost being £3,000,000.

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South African Oil

Prospecting for liquid oil in South Africa until recently has given very small indication of a successful outcome, and it seemed likely that the more profitable proposition would be to work the huge areas of oil-bearing shale. In order to assist in this direction, the Union Government have promised a protective duty against "dumping" by foreign producers, coupled with a bonus on sales ranging from 1s. to 5s. per ton.

Now comes an encouraging report of a continued flow of methane-bearing gas from an old bore-hole in the Heidelberg district, approximately 60 miles south-east of Johannesburg, and a company is being promoted to continue boring. In other parts of the country boring operations have produced satisfactory indications of the presence of petroleum, and in South-West Africa the Administrator has granted a lease of over 700 square miles of land for oil exploitation purposes.

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Special Tracks for Cycles?

In view of the extraordinary congestion of petrol-driven traffic on the roads to-day, a proposal is on foot to construct special roadside tracks for the use of cycles only. The scheme was brought forward at a meeting of the Cyclists' Touring Club and it is stated that cyclists are willing to be taxed in order to pay for the new roads.

Spanish Hydro-Electric Developments

One of the most interesting hydro-electric schemes in the world is that which supplies power to Catalonia, in Spain. The main generating plant in this great system extends almost in an unbroken line along the banks of the Flamisell, Noguera Palaresa and Segre Rivers, three streams that carry the melted snow of the Pyrenees into the Ebro. A group of lakes high up on Mount Maladetta, at an altitude of over 7,000 ft., form the first storage reservoirs for the system.

At intervals down the side are the Capdella plant, developing 40,000 h.p., and Mollinos station 20,000 h.p., while slightly below the latter the river is diverted to Pobla, which also develops 20,000 h.p. Below the Pobla plant lies the Talaran reservoir, a huge concrete dam storing over 200,000,000 cubic metres of water for the purpose of maintaining the flow during periods of drought.

Descending still further there is the Tremp power house, 40,000 h.p., not far from which is planned another station to produce 50,000 h.p. In the valley below lies the Camarasa dam, a narrow winding lake twelve miles in length, that holds almost as much water as the Talaran storage barrage. The plant at Camarasa develops 60,000 h.p. but its eventual capacity will be 100,000 h.p. A specially interesting feature at this point are the spillway gates designed to pass 2,000 tons of flood water per second. These are the largest of their type in the world. The last installation of this marvellous electric supply scheme is at Seros on the river Segre, producing 56,000 h.p.

At Barcelona there are two steam power stations to be used only in case of breakdown or shortage of water supply.

The total capacity of these huge generating stations is 220,000 h.p. and the actual number of kilowatt hours supplied to its customers is 400,000,000. The distribution of this enormous power is carried out by a network of lines, some carrying 25,000 and others 6,000 volts.

Twenty-five years ago Barcelona was a city of smoke. To-day it is smokeless, a condition that may be said to apply to the whole of the state of Catalonia.

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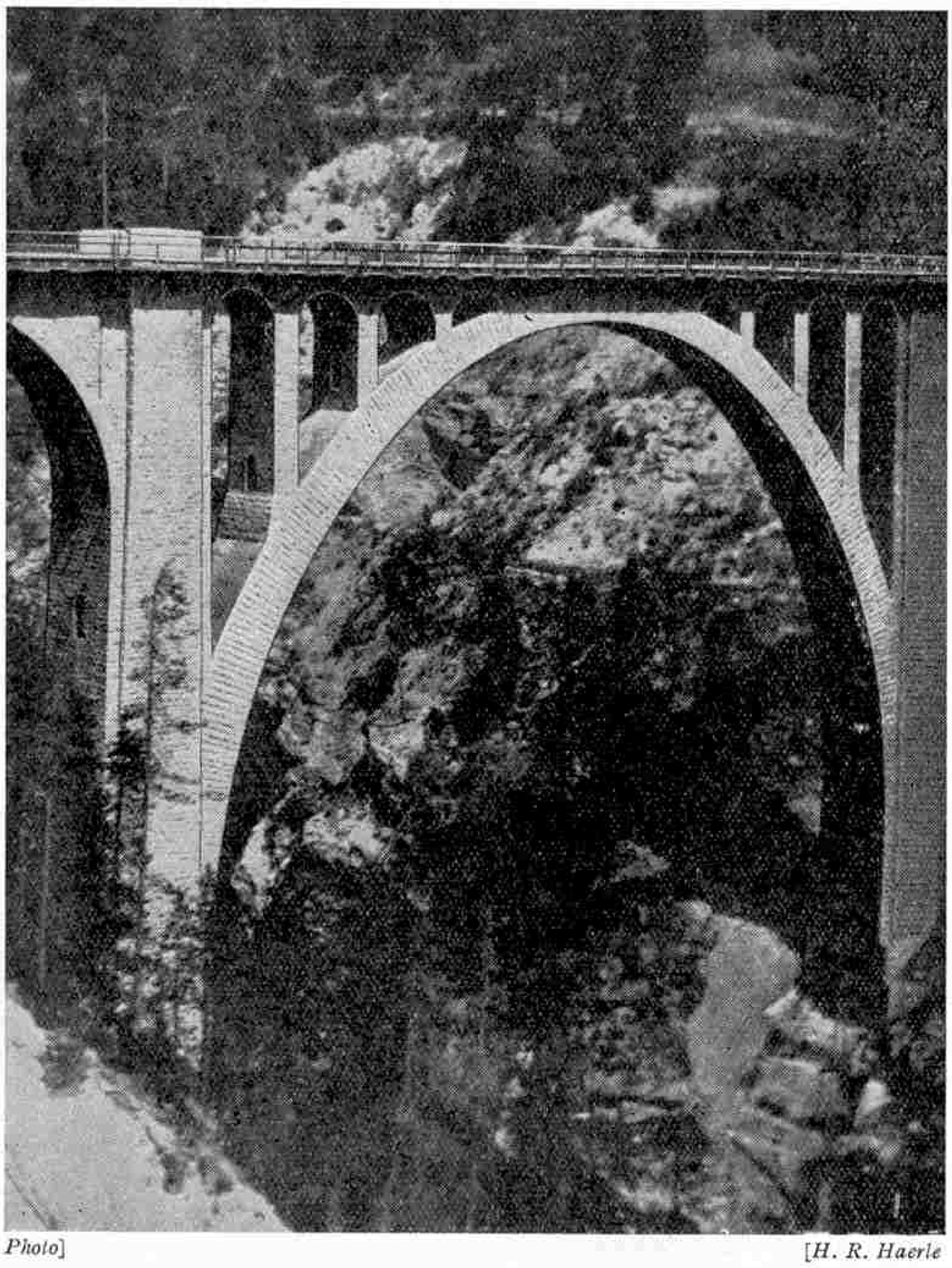
Russian Concrete Ships

The Russian Government has decided to establish a shipbuilding yard for concrete ships at Volsk on the Volga. It is proposed to construct sixty vessels annually.

Famous Swiss Bridge



Photo] [*H. R. Haerle*

The Wiesen Viaduct, situated on the Davos-Filisur Railway, and over 290 ft. above the river (This railway was described in our April and May issues)

Sydney Harbour Bridge

Work on the new bridge in Sydney Harbour is being pushed forward energetically and Messrs. Dorman, Long & Co. Ltd., have almost completed the clearance of the site preparatory to the erection of the approach spans. The bridge itself will be 1,650 ft. in length, and 50,000 tons of steel will be used in the construction. Specially built cranes, weighing 500 tons each and capable of lifting girders up to 160 tons in weight, are to be employed, and one of the special planing machines is described in this issue.

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Human Leak Detector

A curious case of hyper-sensitiveness is reported from the water department of the city of Galesburg in Canada, which has in its employ a foreman who is able to tell the position of a leak in the water mains by means of his teeth. The man, who is deaf, places an iron rod 8 ft. in length on the water main, and according to the vibration transmitted through the rod to his teeth he estimates the location of the leak.

New Giant Cables

At Sennen Cove, near Land's End, the task of landing the greatest telegraph cable in the world was successfully accomplished recently. The cable's weight, 30 tons per mile at the section landed, prevented the cable-ship from bringing it right inshore, and it was necessary to fasten a 4½ in. manila hawser to the cable, which in its turn was supported by barrels that acted as floats. The hawser was led to the beach and a team of men and horses commenced to pull on it at a signal given by the cable-ship's siren. After 20 minutes' pulling the first barrel reached the shore and the end of the cable came in sight. By placing the cable on pulleys it was speedily carried to the telegraph hut.

Three miles of the cable have already been laid and the seaward end is marked with a buoy ready to be picked up when the task of carrying the cable across the Atlantic is commenced. The line is being laid for the Western Union Telegraph Co., and is intended for communication between Land's End and New York via Newfoundland, a total distance of 4,000 miles. Its signalling capacity is four times greater than the type at present in use and it can transmit 2,500 letters, approximately 500 words, per minute. It is probable that the cable will be ready for use by the end of this year.

Another cable that is shortly to be laid will claim the distinction of being the longest in the world. It will stretch between Vancouver on the western coast of Canada to Sanning Island in the Pacific, and its total length will be 4,200 miles. It is being laid for the Pacific Cable Board by the cable ship "*Dominia*," the largest vessel of her type in the world. The "*Dominia*" is owned by the Telegraph Construction and Maintenance Co. She is 509 ft. long, has a beam of 59 ft. and can carry 4,250 miles of cable in her four tanks. The task of laying this cable will occupy between three and four months and the work will be commenced in the early autumn of this year.

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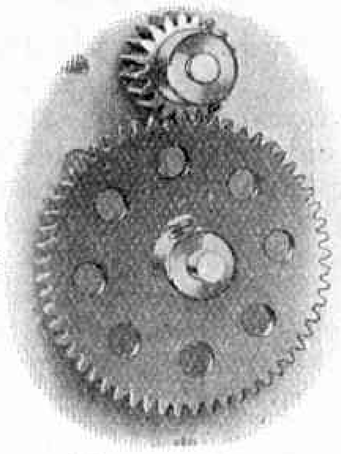
Profits of Motor Engineering Firm

In a recent case before the Federal Court at Detroit, U.S.A., it was stated that the profits of the Ford Motor Company for the seven years ending 1924 amounted to £105,288,390, the highest amount for any one year being £23,159,472, in 1922.



Meccano Gears

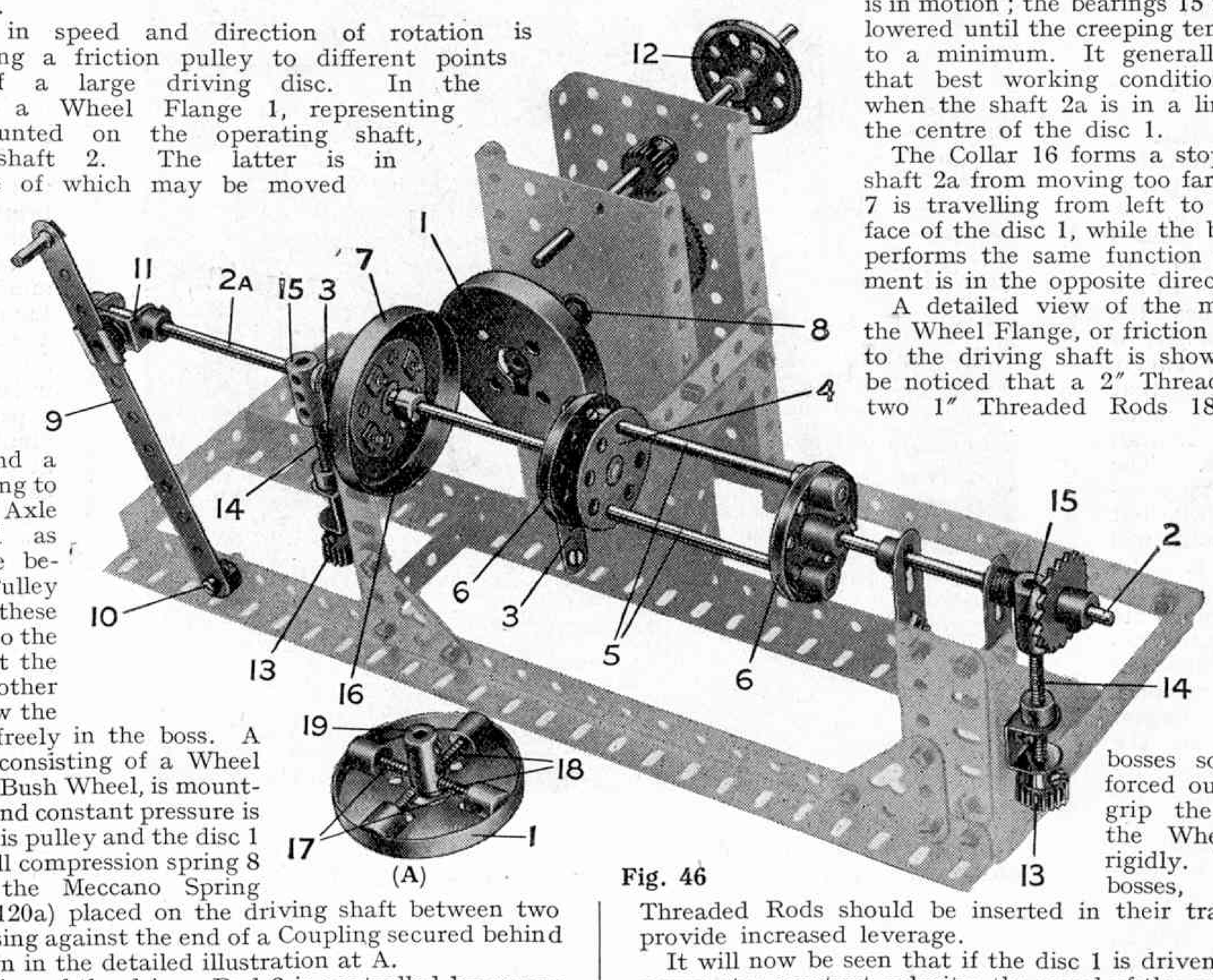
Suggestions Section

Edited by "Spanner"

(46)—Friction Disc Transmission in Meccano

We illustrate below an interesting Meccano model of a drive transmission which provides for a variable speed and reverse gear without the use of toothed wheels. The apparatus depends for its operation upon the friction existing between two discs, one revolving upon the other, and serves as an excellent demonstration of the principle involved in the transmission gear fitted to "G. W. K." motors. We are indebted to the makers of these cars for certain interesting information concerning the operation of the mechanism.

The variation in speed and direction of rotation is effected by moving a friction pulley to different points on the face of a large driving disc. In the Meccano model, a Wheel Flange 1, representing the disc, is mounted on the operating shaft, and drives a shaft 2. The latter is in two sections, one of which may be moved horizontally while the whole unit is in rotation. The adjustment is accomplished as follows: An 8" Rod 2a is mounted in bearings 3, and carries at one end a Bush Wheel 4 sliding to and fro on two 3½" Axle Rods 5 secured as rigidly as possible between two 1½" Pulley Wheels 6. One of these Pulleys is secured to the driven shaft 2, but the set-screw of the other is removed to allow the Rod 2a to move freely in the boss. A friction pulley 7, consisting of a Wheel Flange bolted to a Bush Wheel, is mounted on the Rod 2a, and constant pressure is applied between this pulley and the disc 1 by means of a small compression spring 8 (extracted from the Meccano Spring Buffer, Part No. 120a) placed on the driving shaft between two Washers, and pressing against the end of a Coupling secured behind the disc 1, as shown in the detailed illustration at A.



(A)

Fig. 46

The sliding portion of the driven Rod 2 is controlled by means of a hand lever 9 consisting of a 5½" Strip pivotally attached to the frame by means of bolt and lock-nuts 10 (see "Meccano Standard Mechanisms," Detail No. 262). The Strip moves in an Eye Piece attached in a similar manner to a Double Bracket 11 mounted on the shaft 2a between Collars and set-screws. In actual practice, the use of this adjusting device is avoided by mounting the friction pulley on a splined shaft. It may then be moved to and fro without the necessity of sliding the shaft in its bearings.

For the sake of convenience, the friction disc 1 is connected by means of a ½" Pinion and 57-teeth Gear Wheel to a hand-wheel 12, and on rotation of the latter the model may be set in motion for demonstration purposes.

It will be noticed that the shafts 2 and 2a are journalled through four separate bearings consisting of short Slotted Strips, the elongated holes of which are employed to obtain a vertically adjustable movement of the Rods 2 and 2a. The elevation of the Rods may be altered as required by turning small hand wheels 13, secured to vertical 2" Threaded Rods 14. The latter are mounted in bearings formed from Double Brackets spaced away from the framework by means of two Washers. The upper ends of the Rods 14 engage Threaded Couplings 15, through which the Rods 2 and 2a are journalled. This vertical adjustment is necessary to overcome a tendency of the friction pulley to creep across the face of the disc while the mechanism is in motion; the bearings 15 must be raised or lowered until the creeping tendency is reduced to a minimum. It generally will be found that best working conditions are obtained when the shaft 2a is in a line slightly below the centre of the disc 1.

The Collar 16 forms a stop to prevent the shaft 2a from moving too far when the pulley 7 is travelling from left to right across the face of the disc 1, while the boss of the pulley performs the same function when the movement is in the opposite direction.

A detailed view of the method by which the Wheel Flange, or friction disc 1, is secured to the driving shaft is shown at A. It will be noticed that a 2" Threaded Rod 17 and two 1" Threaded Rods 18 are inserted at right-angles to one another in the end of a Coupling 19, whilst Threaded Bosses are mounted on the four outer ends of the Rods. The Wheel Flange is secured by turning the bosses so that they are forced outward until they grip the inner sides of the Wheel Flange very rigidly. To tighten the bosses, long bolts or Threaded Rods should be inserted in their transverse holes to provide increased leverage.

It will now be seen that if the disc 1 is driven by some motive power at a constant velocity, the speed of the countershaft 2 may be varied to a considerable extent by altering the position of the point of contact between the friction pulley 7 and the disc. Supposing, for example, that the lever 9 is pulled as far as it will go away from the disc; then the pulley 7 will rest on the disc at the farthest permissible point from the driving shaft, and therefore will rotate at a maximum speed. But if the lever is pushed gradually forward, the pulley must move nearer the centre of the driving disc, with a consequent reduction in speed, until finally it reaches the central or neutral position, where it becomes disengaged owing to the aperture in the middle of the disc. By continuing the movement of the lever 9, the pulley is again thrown into frictional engagement. This time, however, it rotates in the reverse direction, since the point of contact with the disc is on the opposite side of the driving shaft.

It should be noted that in actual practice the circumference of the driven pulley is fitted with rings of special friction material,

(*Continued at foot of column 1, next page*)

(47)—Reversing Gear

(R. W. Rush, Accrington)

This is a compact type of reversing gear in which either of the Rods 1 and 2 may be used as the driving shaft. They are mounted in line with one another in any suitable bearings, and each carries at its inner end one segment of a Dog Clutch 3, and one ¾″ Pinion 4, 5. The Rod 1 is slidable in its bearings and is controlled by a lever 6 pivotally mounted at 7 and carrying a bolt 8, the head of which engages between two Collars and set-screws on the shaft 1. In the first position of the lever the ¾″ Pinion 4 is caused to engage with a 1½″ Contrate Wheel 9, whilst in its second position the Pinion is thrown out of engagement and the clutch members are combined. Therefore, supposing the Rod 1 to be the driving shaft revolving in a clockwise direction, in the first position of the lever it must impart anti-clockwise rotary movement to the secondary shaft 2, owing to the

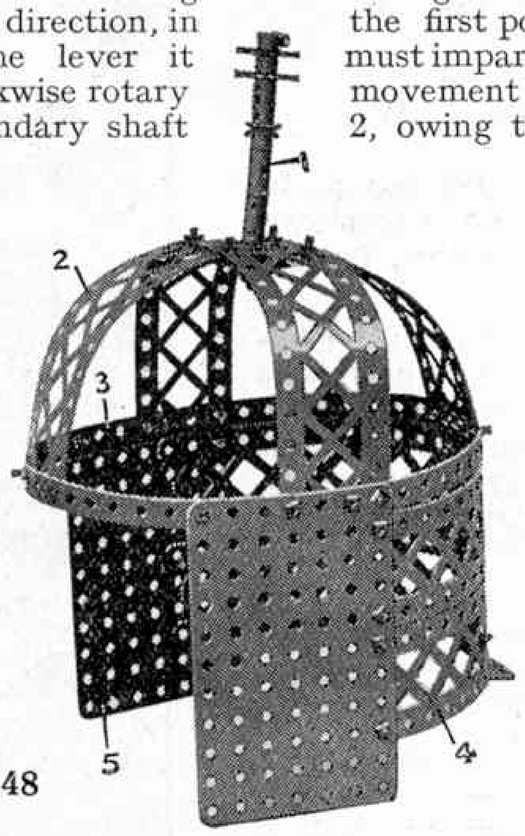


Fig. 48

action of the Contrate Wheel 9 and ¾″ Pinion 5. In the second position, however, the Rods 1 and 2 are combined and rotate as a single unit. The Pinion 5 remains in constant engagement with the Wheel 9.

Friction Disc Transmission

(continued from previous page)

such as leather, to increase the grip on the driving disc. The rings may be removed when worn and quickly replaced with new ones.

Although a certain amount of theoretical prejudice appears to exist in regard to friction-driven mechanism, the value of the device is proved conclusively by the actual performances of "G.W.K." cars, for they are capable of climbing steep ascents or carrying heavy loads without any fear of slip taking place in the patent disc transmission.

The use of the mechanism in Meccano model-building will be apparent, for it may be adapted to numerous models in which variable speed and reverse gears are required. The Clockwork or Electric Motor should be coupled by any suitable gearing to the driving disc 1, while the mechanism to be operated must be connected to the driven Rod 2.

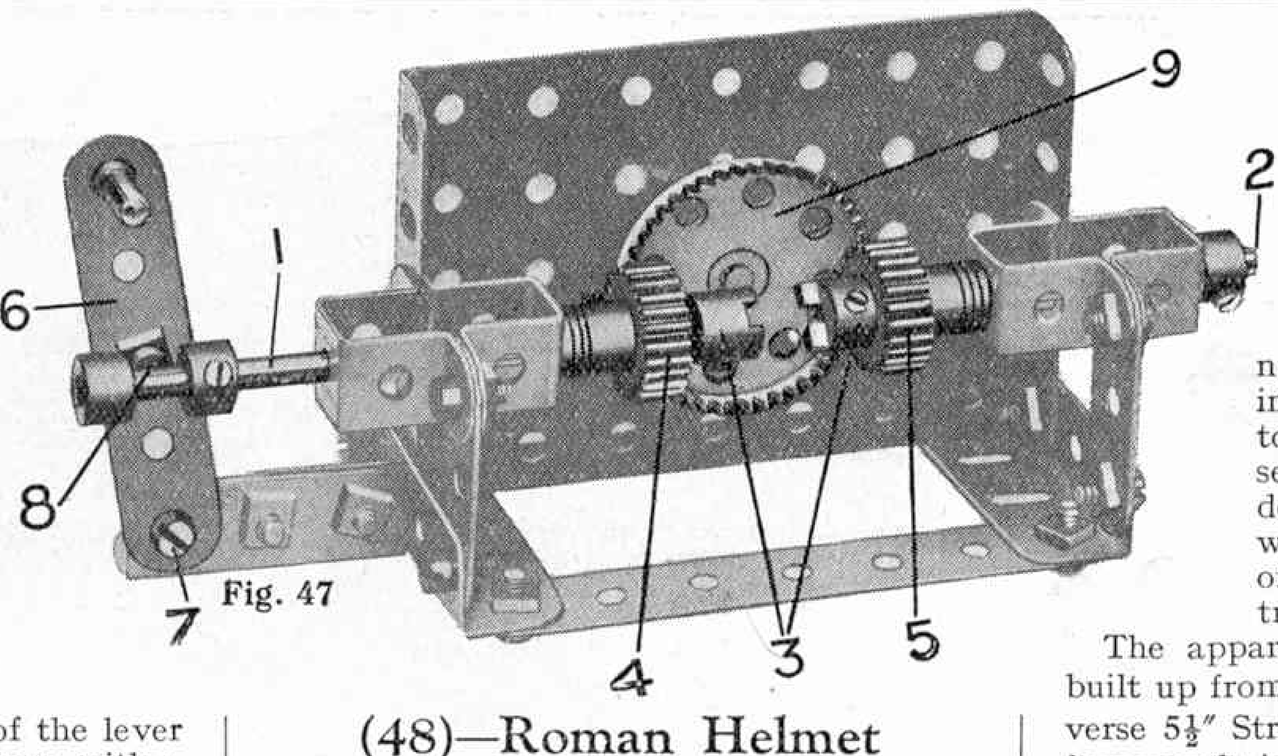


Fig. 47

(48)—Roman Helmet

(H. Glendenning, Liverpool)

The amusing representation of a Roman helmet shown in Fig. 48 should provide an ideal head-dress for the Meccano boy attending a fancy dress carnival or taking part in private theatricals, etc.

The helmet is built up from two 12½″ Strips 3 bolted in the shape of a circle and carrying 12½″ Braced Girders 2 bent over to form the crown. The ornamental piece 1 consists of Couplings and 1″ Sprocket Wheels bolted to an Axle Rod. Further 12½″ Braced Girders 4 are bolted to the side plates 5, and two 5½″ Strips are secured to the Strips 3 in the rear of the helmet, with their lower ends bent outward as shown in the illustration.

(49)—Device to Increase Length of a Crank Stroke

(G. V. Redfern, Two Dales, Nr. Matlock)

Fig. 49 illustrates a form of rack and pinion mechanism with which the length of a crank or piston stroke may be doubled. The connecting- or piston-rod is placed on the end of a ¾″ Bolt 2, which passes through an Eye Piece 3 and carries on its shank a ½″ Pinion 4. The latter rolls on a Rack Strip 5 secured by Angle Brackets to the base of the model. A second Rack Strip 6 bolted to two Eye Pieces 7 sliding on a 5½″ Strip 8 also engages with the Pinion 4. At each stroke of the arm 1 the Pinion 4 is caused to rotate, owing to its engagement with the Rack Strip 5, and thereby thrusts the upper Rack Strip in the same direction as that in which the arm 1 is moving, but through a distance twice as great. The Strip 8 is bolted at each end to 1½″ Strips secured to the base by means of 1″ Angle Brackets. A second guide Strip 9, secured at either end to a 1″ × ½″ Angle Bracket, supports the Eye Piece 3.

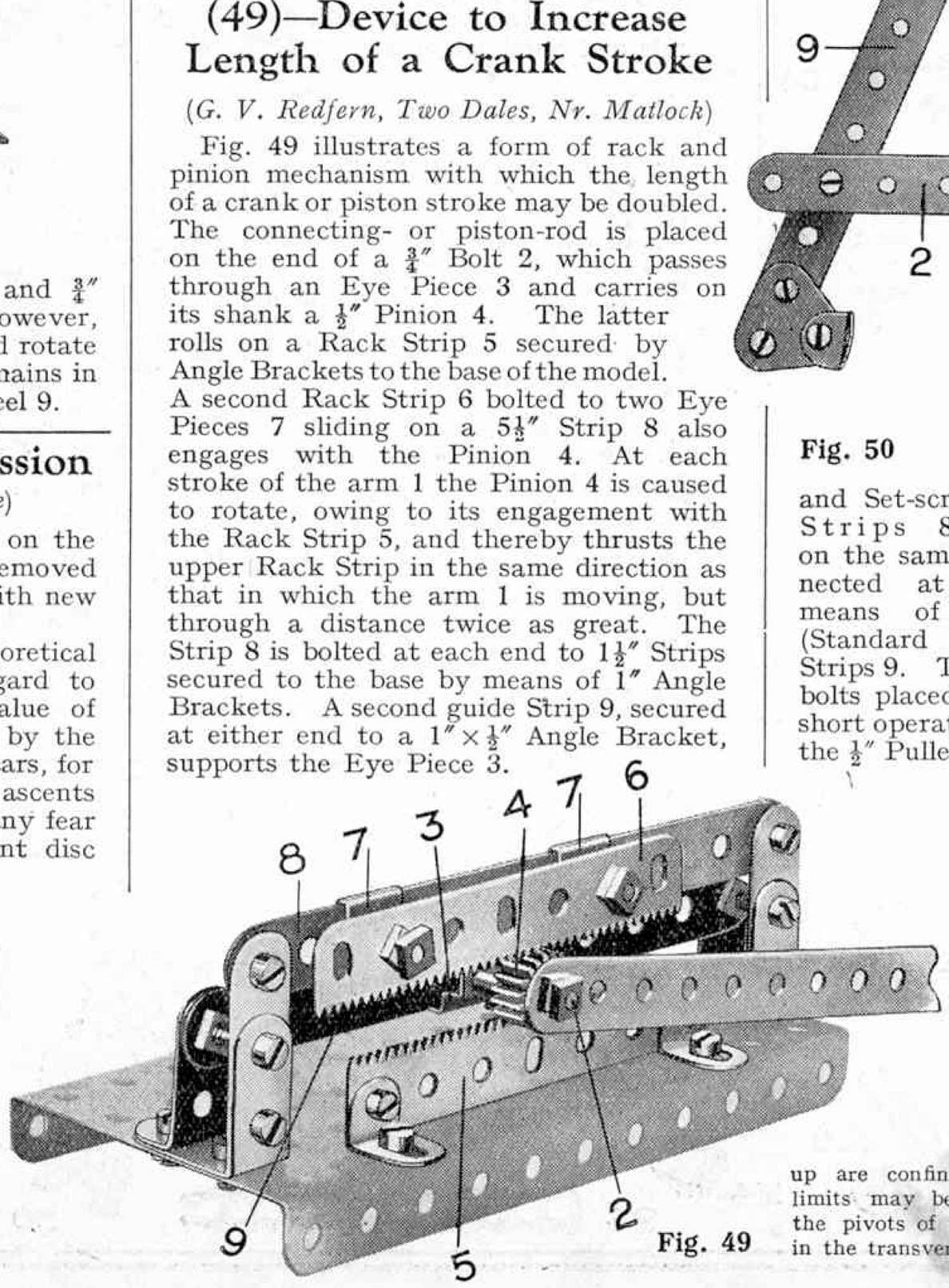


Fig. 49

(50)—Friction Grip-Tongs

(Norman Peel, Morecambe; R. J. Darneley, Basingstoke; P. W. Bedale, Cambridge; L. W. Jubb, Sheffield; P. Higgin, Bristol; F. Moore, Aughton; R. Watts, Woodford Green; and G. K. Hooper, Liscard).

We have received a large number of suggestions regarding a friction grip, or lever grip-tongs, for use with block-setting cranes, and in the device illustrated in Fig. 50 we have combined the work of all the above-named contributors.

The apparatus comprises a framework built up from 3½″ Strips 1 bolted to transverse 5½″ Strips 2 and 1½″ Strips 3. This framework is in duplicate, and the two sides are spaced apart by means of Washers placed on the four combining bolts. Two 3½″ Strips 4 secured to a Hook 5 are arranged to slide between the Strips 3. They are guided in this movement by means of two ½″ loose Pulleys 6 mounted on a short Axle Rod and held in place—one on either side of the Strips—

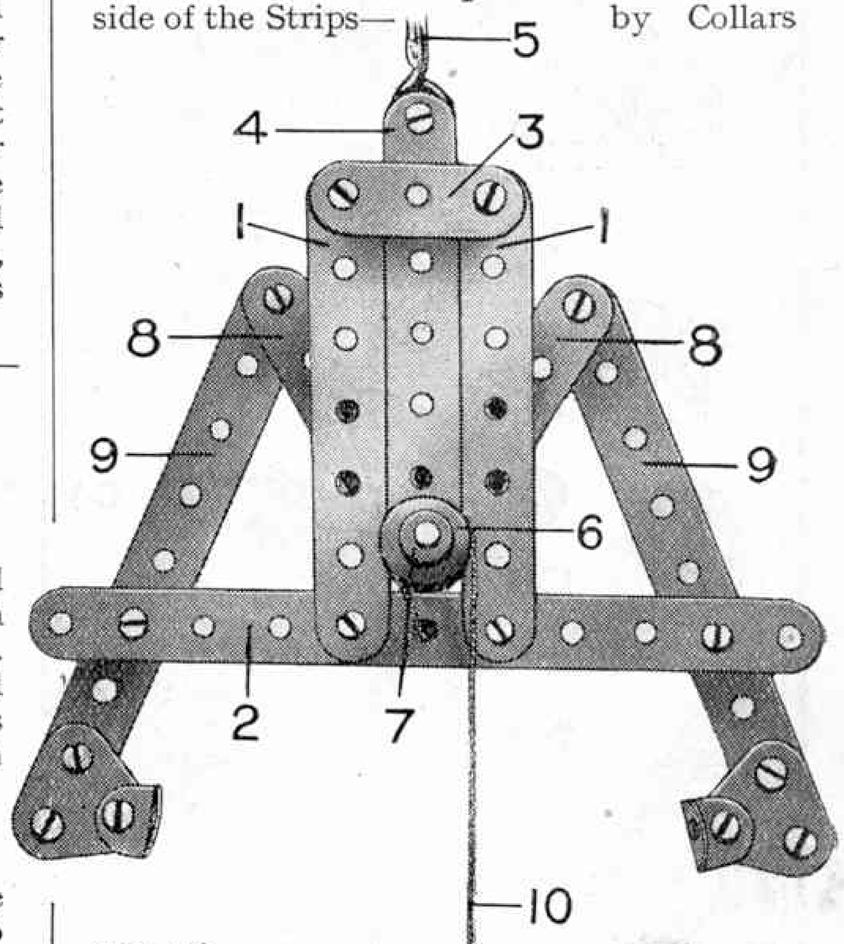
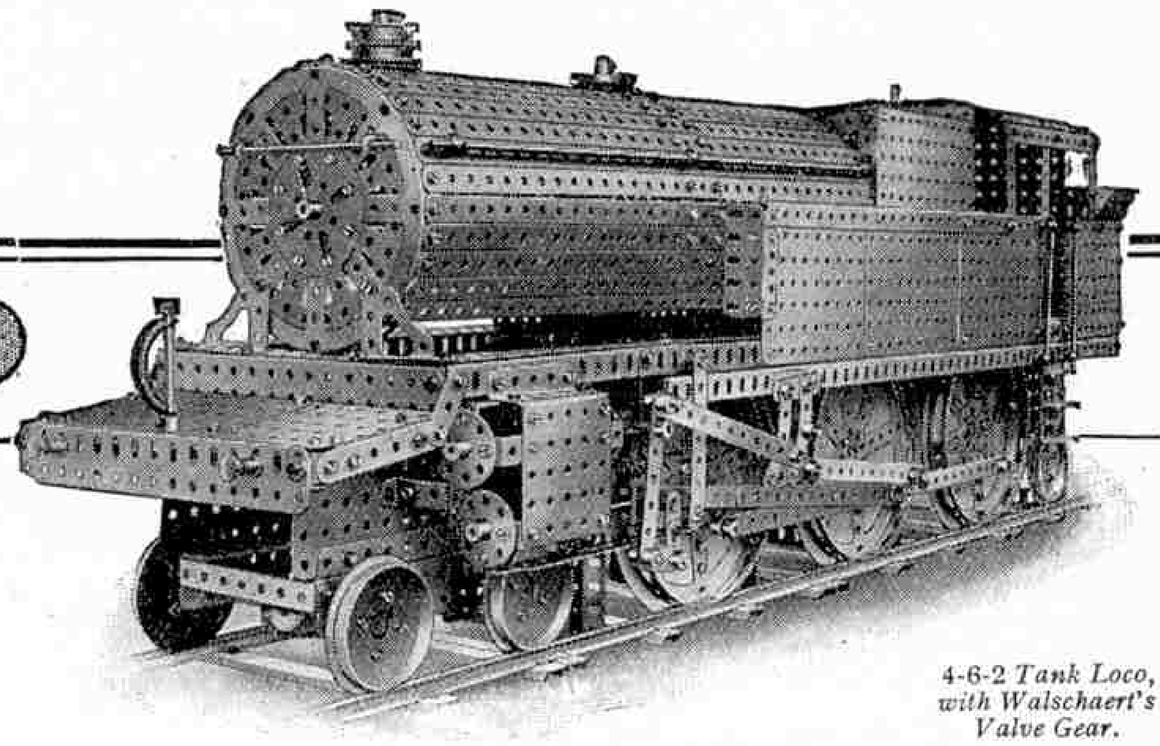


Fig. 50

by Collars and Set-screws 7. Strips 8 are on the same Axle nected at their means of pivot The ends of two 2½″ mounted pivotally Rod, and are con-outer ends by bolts and nuts (Standard Mechanism No. 262) to 4½″ Strips 9. The latter are free to move about bolts placed through the 5½″ Strips 2. A short operating cord 10 passes round one of the ½″ Pulleys 6, and is secured to Strips 2.

Upon pulling the cord, the jaws of the grip are opened so that they fall on either side of the block that is to be raised; it is then released and the pull of the hoisting cord attached to the Hook 5 acts through the levers 8 and 9 and causes the jaws of the grip to close very tightly on the block. Since the pull on the Hook varies with the extent of the load, the friction created between the jaws of the grip and the block is sufficient always to raise the block, whatever its weight, without other support. The actual dimensions of the blocks that may be picked up are confined within certain limits, but these limits may be varied to some extent by moving the pivots of the 5½″ Strips 9 to some other position in the transverse Strips 2.



4-6-2 *Tank Loco, with Walschaert's Valve Gear.*

MECCANO

ACCESSORY PARTS

You can build this fine model loco entirely from Meccano parts. When you become tired of it—if ever !—you may take it to pieces, and with the same parts construct Looms, Clocks, Motors, Cranes, Ships, Guns, Machine Tools—anything you wish !

Meccano parts are put to innumerable uses in addition to model-building. They are employed by engineers, students and professors of engineering, inventors, builders, and mechanics. Big engineering firms use them to demonstrate the working of the various machines they manufacture, as well as to try out new ideas, new movements, etc. They may be used with advantage in the construction of radio sets and hundreds of similar devices.

			s.	d.
19A.	Wheels, 3", with set screw	each	0	8
20.	Flanged Wheels	„	0	6
24.	Bush Wheels	„	0	6
25.	¾" Pinion Wheels... ...	„	0	6
26.	½" „ „	„	0	4
27.	Gear Wheels, 50 teeth	„	0	9
27A.	„ „ 57 „	„	0	9
28.	1½" Contrate Wheels ...	„	0	9
29.	¾" „ „ ...	„	0	6
30.	Bevel Gears	„	0	10
31.	1" Gear Wheels, 38 teeth	„	1	0
32.	Worm Wheels	„	0	6
43.	Springs	„	0	2
44.	Cranked Bent Strips ...	„	0	1
45.	Double Bent Strips ...	„	0	1
50.	Eye Pieces	„	0	2
57B.	Hooks (loaded)	„	0	5
59.	Collars and Set Screws	„	0	2
62.	Cranks	„	0	3
63.	Couplings	„	0	6
63B.	Strip Couplings	„	0	8
63C.	Threaded Couplings ...	„	0	6

			s.	d.
64.	Threaded Bosses ...	each	0	2
94.	Sprocket Chain	per length	0	6
96.	Sprocket Wheels, 1" ...	each	0	3
109.	Face Plates, 2½" diam.	„	0	4
114.	Hinges...	per pair	0	4
115.	Threaded Pins	each	0	2
116.	Fork Pieces	„	0	3
118.	Hub Discs (5½" diam.)	„	1	3
119.	Channel Segments (8 to circle, 11½" diam.)	„	0	4
120A.	Spring Buffers ...	per pair	0	8
127.	Simple Bell Cranks ...	each	0	3
128.	Boss Bell Cranks ...	„	0	4
129.	Rack Segments, 3" diam.	„	0	6
130.	Triple Throw Eccentrics	„	1	3
132.	Flywheels, 2¾" diam....	„	2	3
136.	Handrail Supports ...	„	0	3
137.	Wheel Flanges	„	0	4
140.	Universal Couplings ...	„	0	9
144.	Dog Clutch	„	0	6
147.	Pawls with Pivot Bolts	„	0	3
148.	Ratchet Wheels ...	„	0	9

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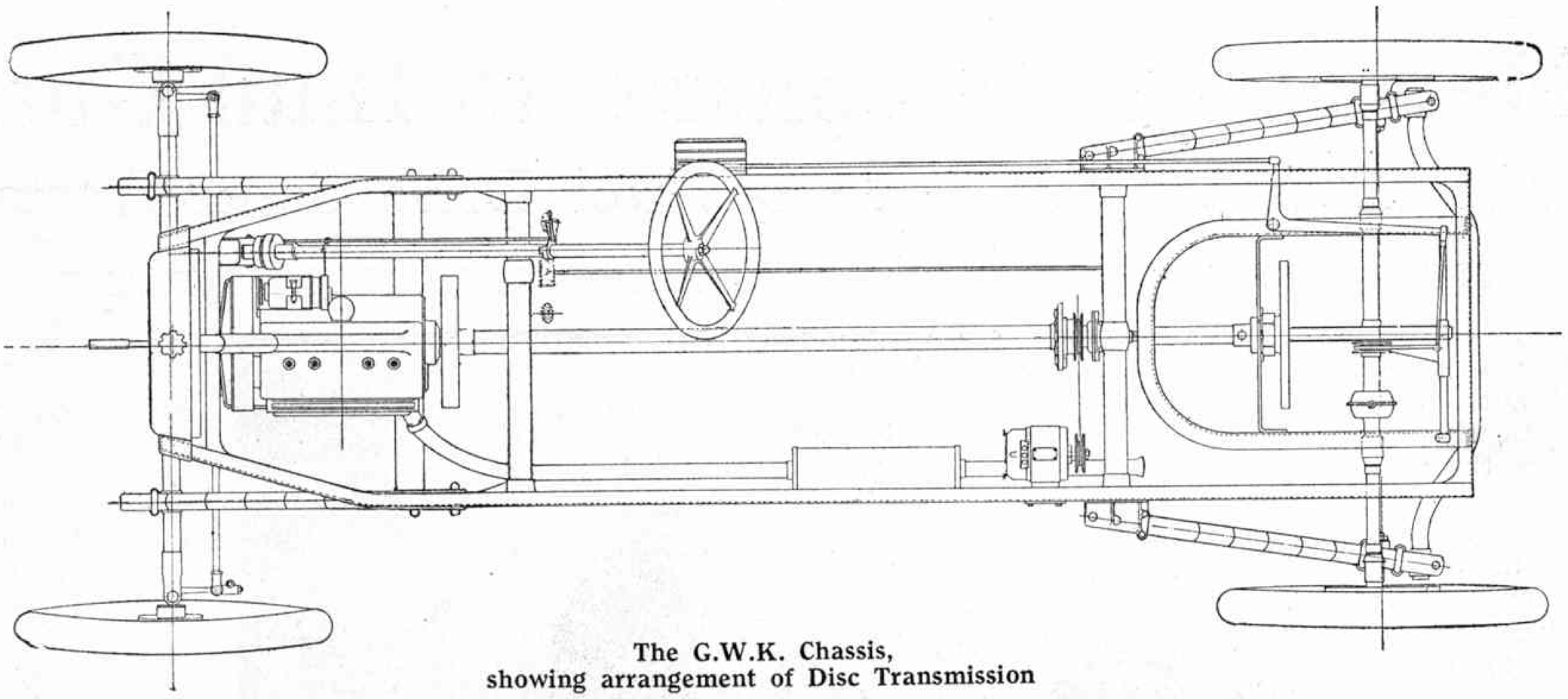


The G.W.K. Chassis,
showing arrangement of Disc Transmission

This diagram of the G.W.K. motor chassis should be of interest in connection with the Meccano model of frictional drive transmission described on another page. The quadrant of the change-speed lever may be seen at the right of the steering wheel. The lever is connected through bell-cranks to the friction pulley sliding on the splined rear axle, and engaging the surface of the driving disc on the end of the propeller shaft. The remarkable simplicity of the mechanism will be appreciated from the above plan.

In Reply

In these columns we reply to suggestions regarding improvements or additions to the Meccano and Hornby Train systems. We receive many hundreds of such suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Every idea, however, whether acknowledged in these columns or not, is carefully examined and considered. Practical suggestions that prove to be in popular demand are marked down for adoption at the first available opportunity. It would be of great assistance if readers, when submitting suggestions for consideration, would write them on separate sheets of paper and include their name and address on each sheet used.

Suggested Meccano Improvements

RE-NUMBERING MECCANO PARTS.—We have had in mind for some time the question of re-numbering Meccano Parts in order to group Strips, Wheels, etc., under separate headings. We fear that the necessary alterations, however, would create confusion, although one or two changes may be carried out as opportunity occurs. (*Reply to G. S. Marsh, Blackpool*).

MECCANO CARTONS.—Meccano Outfit cartons may be obtained separately through your dealer. Meccano boys who possess several Accessory Outfits and loose parts may obtain larger boxes, therefore, to keep pace with their growing requirements. (*Reply to R. C. Roberts, Scunthorpe*).

Suggested New Meccano Parts

NEW WORM WHEEL.—We note your suggested design for a new wheel with curved teeth to gear with the Meccano Worm. This would be an expensive part to produce and its advantages would be small, since practically no backlash exists in the present worm drive. The existing Gear Wheels, as well as the Pinions, may be driven very smoothly from the Worm. (*Reply to F. Ainsworth, Manchester*).

WIRE STAY-RODS.—We have considered previously the introduction of stay and tie rods of different lengths, such as you suggest, but it is difficult to standardise these parts so that they may be of use for different purposes. (*Reply to E. G. Caswell, London, W.12*).

CIRCULAR RACK.—Thank you for your suggestion that Rack Strips should be bolted around the circumference of a Circular Girder when a large reduction gear is required. We have made use of a similar device already in certain Meccano models, but we would remind readers that great care must be taken in bolting the Rack Strips in position in order to allow for their proper engagement with a toothed wheel. (*Reply to D. Henshaw, Bolton*).

BENT FORK PIECE.—We are experimenting with your suggestion that a boss should be secured to the centre of a Double Bent Strip, but we do not think that such a part would hold any great advantage over the existing Fork Piece. (*Reply to S. J. Shallice, London, S.E.6*).

SMALL CRANK HANDLE.—We do not think it is necessary to manufacture a special type of Crank Handle that may be fitted to any length of Axle Rod, for several examples of Meccano handles are shown under Standard Mechanism Nos. 255 to 259, and others. (*Reply to C. H. Barratt, Southampton*).

CATERPILLAR MOTION.—We are experimenting with a caterpillar motion for Tractors, and hope to devise something suitable from the existing parts. (*Reply to W. Messenger, Rochester*).

TRACTOR FUNNELS.—See our remarks under this heading in the February "*M.M.*" (*Reply to A. Hinsley, Thelwall, Nr. Warrington*).

CURVED SLOTTED STRIPS.—We do not think there would be many uses for this part. With regard to your suggestion for larger flanges for railway wheels, see our reply under this subject in the May "*M.M.*" Your suggestion for 1"×½" Hinges will have consideration later. At present we find that the existing Hinge meets every requirement. (*Reply to A. Roberts, Torquay*).

SMALL FLANGED PLATE.—We doubt whether many advantages would be derived from the introduction of Flanged Plates 1½"×2½"; when such a part is required it can usually be substituted without trouble by Double Angle Strips or similar parts. (*Reply to K. L. Healey, Burnley*).

CAM.—When a cam is required in Meccano models we find that it is generally more satisfactory to construct same from the existing parts, for the type of cam required varies in almost every model, and in this connection we would refer you to Standard Mechanism Nos. 261, 264 and 266. You will note from recent replies in these pages that most of your other suggestions are already under consideration. (*Reply to H. Cuthbert, Narandera, N.S.W.*)

SLEEVE FOR AXLE ROD.—We do not think much use could be found for your suggested Axle Rod having a sleeve piece capable of revolving independently about its circumference. Your other suggestions are already under consideration. (*Reply to F. Brewin, Chesterfield*).

CHUCK.—A Meccano Coupling or similar part would serve the purpose of a chuck in lathes, drills, etc. (*Reply to E. Fewster, York*).

NEW WORM GEARS.—There appears to be little demand for a Worm Gear having teeth of a larger pitch than the present design. Moreover this part would not be interchangeable with the existing toothed Wheels. (*Reply to M. Mycock, Manchester*).

LARGE CONE PULLEY.—It is usually possible to employ three of the larger Pulley Wheels when a part of the size mentioned is required for use in conjunction with the existing Cone Pulley. (*Reply to D. Ford, Erdington*).

SHIP'S PROPELLER.—A ship's propeller would be of little practical use in Meccano models. (*Reply to D. Staley, Ilford*).

MECCANO RADIATOR.—A realistic miniature radiator can be built with the existing parts when required. The Eye Piece has been improved recently and now slides on 12½" Strips with ease. (*Reply to C. Deacon, Norwich*).

Suggested Hornby Improvements

STATION STAFF.—See our remarks on this subject in the March "*M.M.*" (*Reply to W. A. Reading, Birmingham*).

NEW LEVEL CROSSING.—We shall consider the introduction of a level crossing fitted with one rail only, for single track working. (*Reply to A. W. Cockman, London, N.12*).

No. 1 TANK PASSENGER SET.—The question of introducing a passenger set, having a No. 1 Tank Loco as motive power, will come up for consideration later. (*Reply to S. Camm, London, N.4, D. Walpole, London, S.E.4, H. M. Enion, Blackrod, Nr. Chorley, A. C. Perryman, Old Shoreham, R. Coverdale, Hornsea, and others*).

DISTANT OPERATION OF SIGNALS.—We are at present engaged in the design of apparatus with which signals situated at various points in a Hornby layout may be controlled from a central signal-box. (*Reply to H. R. Trim, Guildford*).

ARMOURED TRAINS.—We do not think there is much demand for model armoured trains. There is no reason why ordinary Hornby Trains should not be used with toy soldiers. (*Reply to H. R. Trim, Guildford*).

SOUTHERN COLOURS AND GOODS DEPOT.—See our replies in the April and March Magazines respectively. We note your suggestions for various additions to the Hornby rolling stock. (*Reply to F. C. Newton, Bristol*).

EXTENSION OF WINDING SPINDLE.—We do not consider the advantage of a winding spindle extending to either side of the loco would be sufficient to warrant the necessary alterations to the design of the loco. (*Reply to C. Wicks, Addiscombe*).

CATTLE PENS, etc.—Suggestions for cattle pens and other accessories for goods yards are receiving attention. (*Reply to P. Goalen, Great Crosby, F. C. Newton, Bristol, and H. A. Jones, Liverpool*).

VESTIBULE COACHES.—We hope to introduce vestibule coaches shortly. Detachable destination boards for Pullman Coaches are under consideration. (*Reply to N. S. Dunn, Kingston-on-Thames*).

THREE-WAY POINT.—We are not familiar with this type of rail and do not think that it would perform any particularly useful functions in Hornby layouts. With regard to the introduction of Southern livery and privately-owned wagons, see our replies in previous issues. (*Reply to R. Lyle, Hereford*).

CANADIAN RAILWAY ROLLING STOCK.—We regret we are unable for the present to introduce rolling-stock and accessories modelled on the Canadian railways. (*Reply to H. R. Trim, Guildford*).

CLOCKWORK "ELECTRIC" TRAINS.—A model of the Metropolitan electric train equipped with clockwork mechanism is now in course of preparation, and will be added to the system shortly. (*Reply to Percy Chadwick, Manchester, and others*).

NEW SIGNALS.—See our replies concerning signalling in the "*M.M.*" for February and May. (*Reply to J. A. Wynne, Bridgwater*).

DOUBLE TRACK VIADUCT.—Your suggestion has been noted for examination later. (*Reply to A. V. Strong, Cardiff*).

PONY-TRUCKS FOR No. 1 LOCOS.—We do not think it is advisable to alter the wheel arrangement of the No. 1 Locos. The addition of a pony-truck would not greatly enhance their appearance. (*Reply to J. R. Band, Rock Ferry, Birkenhead*).

S. & D.R. COLOURS.—The introduction of rolling-stock enamelled in the livery of the Somerset and Dorset Railway is not advisable, since the colours of this line are not familiar to the majority of Hornby Train enthusiasts. (*Reply to K. Harrison, Bradford*).

ATLANTIC LOCOS.—This type of loco is already under construction and we hope to announce its availability shortly. (*Reply to K. Harrison, Bradford, A. W. Cockman, London, N.12, and others*).

Mechanical "Elephant" to Haul Guns

The 100 h.p. "Hathi" Four-Wheel Drive Super-Tractor

ONE of the most important things learned early in the War was the necessity of quickly being able to transport men, armaments and supplies from one place to another, and so to generally increase their usefulness by making them more mobile.

In the early stage of the War the Germans had a great advantage over us in this respect, and there is no doubt that at the outset this did much to prolong the War. The organisation of their transport system was not only more efficient, but the transport methods employed were more numerous. The efficient and extensively-organised railway communications, for instance, increased the mobility of their forces very considerably. The enemy were able to concentrate their forces at any chosen spot whenever they wished to launch an offensive, and so they were able to make sudden attacks on all fronts. Without efficient mobility, these "drives" would not have been possible.

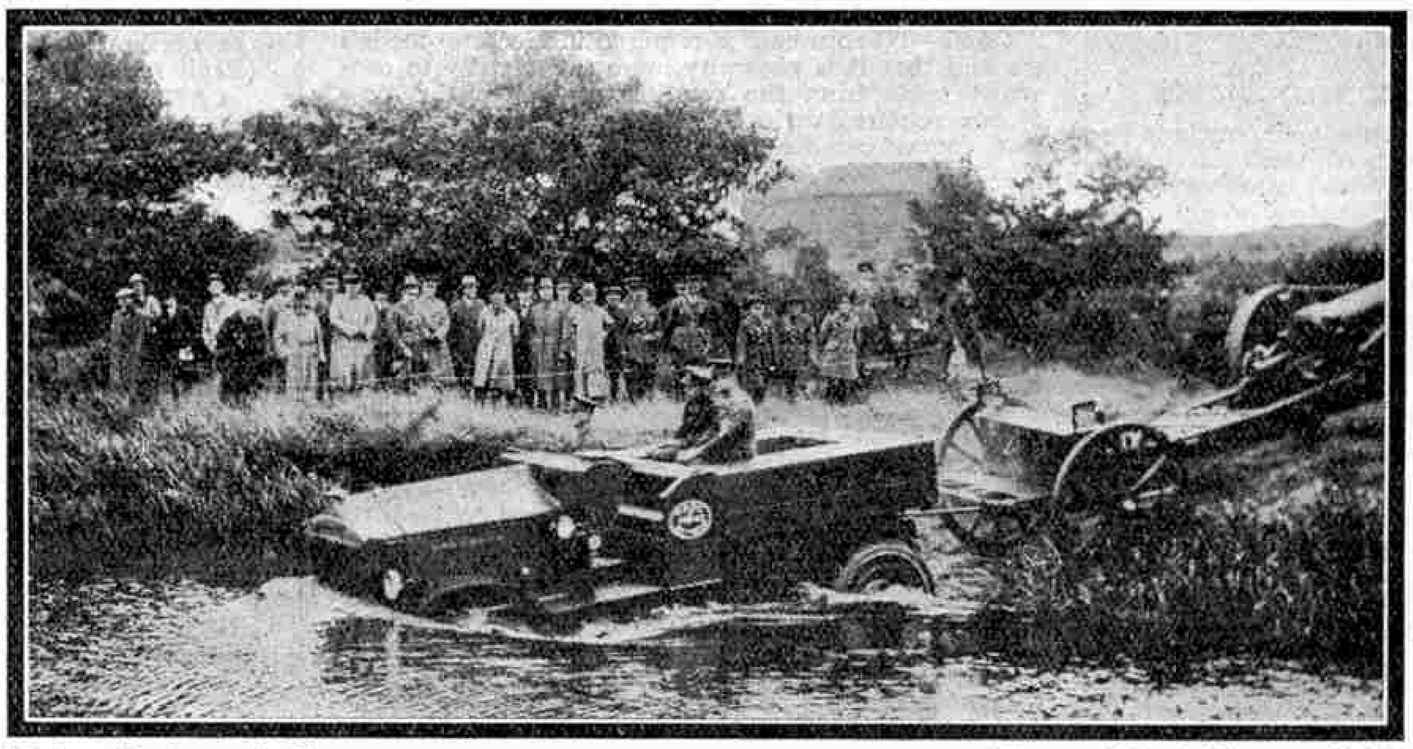
Of course, as the War progressed, the Allies developed their transport and the enemy's advantage in mobility became negatived to a large extent, and our motor transport did a great deal to counteract the wonderful railway system behind the German lines.

The "Hathi" hauling a heavy howitzer up a hill in recent War Office tests

Since the war, the different forms of mechanical transport, all types of which have a direct bearing on the question of mobility, have undergone considerable modification and improvement. Even the famous tanks have been improved and the post-war types, we are told, are vastly superior—both in speed and effectiveness—even to the highly-developed tanks of the latter part of the War.

In another direction, too, considerable developments have been taking place. Although horses have always been largely used for artillery haulage during the War, many of the heavier guns were successfully hauled by tractors or some similar type of mechanical haulage. In the next war—if such a calamity ever occurs again—there seems but little doubt that horses will be eliminated and that their place will be taken almost entirely by mechanical haulage. At any rate considerable activity in this direction is now being manifested in more than one direction.

One of the most interesting developments on these lines is the "Hathi" tractor, made by Messrs. John I. Thornycroft & Co. Ltd., and intended for the haulage of heavy guns over open ground. The name "hathi" means "elephant," and as it implies strength and power it is happily chosen, for this new super-tractor possesses almost incredible capabilities in traversing ditches and scaling obstacles when running over open country.



Photographs by courtesy] [*Messrs. John I. Thornycroft Ltd.*

Unaffected by water—hauling a howitzer through a deep stream

Developed and built in collaboration with War Office experts, the "Hathi" has proved very successful. A considerable number of these vehicles have already been acquired to form the nucleus of a heavy mechanical transport section for the Army, and the Admiralty and the Air Force have also placed orders.

In running order the tractor weighs approximately 4 tons. It is fitted with a 6-cylinder engine, rated at 54 h.p. but actually developing twice this power, capable of exerting a steady draw-bar pull of nearly 10,000 lbs. It is fitted with a 6-speed gear-box, the drive being on all four wheels, which are fitted with 40″×8″ giant pneumatic tyres.

Amongst the many surprising feats that this amazing tractor performs is the hauling of a 10-ton trailer load up a gradient of 1 in 10 at a speed of seven miles per hour, or at 30 m.p.h. on an ordinary road. It will traverse any kind of ground that a four-wheeled vehicle could reasonably, or almost unreasonably, be expected to cover. One of its most striking performances was in the War Office trials, when it crossed a canal, with two wagons in tow. It approached the canal at a place where the banks were broken, plunged in, crossed on the muddy bottom, and having ascended the other side, turned and returned by the way it had come. In the centre of the canal the wheels were completely submerged, and the tractor was flooded.

An even more difficult feat for a wheeled vehicle was then performed. A ditch, or rather pit, measuring 32 ft. from crest to crest, was excavated. At one side the wall of local earth had a batter of 1 in 3½, on the other it rose more steeply, and was protected by sleepers. The "Hathi," without anti-skid chains on its tyres, descended the ditch by the 1 in 3½ side, and apparently standing almost on end climbed up the steep side. Then turning round, it went down the steep side, until it came to rest with its front wheels on the bottom. Then the gear was placed in reverse, and the tractor climbed out backwards! Such a test on a greasy surface left no doubt about the extraordinary adhesion of the four-wheel drive, and at the same time exhibited the remarkable efficiency of the brakes.

It may perhaps be mentioned that in the event of a hill proving too steep, or the ground quite unsuitable, for the tractor to haul its trailer load, an alternative is provided by a winch and 500 ft. of cable. By means of this device, the load may be hauled over difficult ground, after the "Hathi" has first run forward and locked its wheels by special scotches.

Prior to adopting the "Hathi" design of tractor the War Office carried out many trials of competitive machines having caterpillar and similar drives. Although some of these certainly were superior on marshy ground, where the heavier load of the "Hathi" might cause it to sink in, it was abundantly proved that the "Hathi" is capable of doing between 80 and 90% of the work that tracked vehicles can do, while none of its rivals could approach its strength and all-round utility.

In addition to its value for military transport there is undoubtedly a future for this type of tractor in the commercial world, particularly overseas for the transport of lumber and other such pioneer work in undeveloped territory. Its future development in this respect will doubtless be watched with interest, even though its present cost is somewhat prohibitive to private buyers.

"Tippler" Competition

As promised last month, we give below the results of the Meccano "Tippler" Competition.

Two competitors tied for first place, and each will be presented with a prize consisting of Meccano products to the value of half a guinea. They are N. Downey, 59, Clarence Street, Kingston-on-Thames, and J. B. Holt, 2, Brighton Avenue, Levenshulme, Manchester. A second prize, consisting of Meccano products to the value of five shillings, has been secured by W. W. Harbord, "Woodlands," Guildford.

In addition, the following competitors will each be presented with a special Certificate of Merit, in appreciation of the excellence of their work; I. P. Simpson, Ulverston; R. Wiegold, Bermondsey, S.E.16; R. Worrall, Mossley Hill, Liverpool; R. McVie, Blackburn; P. H. Simon, Holt, Norfolk; and R. S. Quick, Pontypridd.

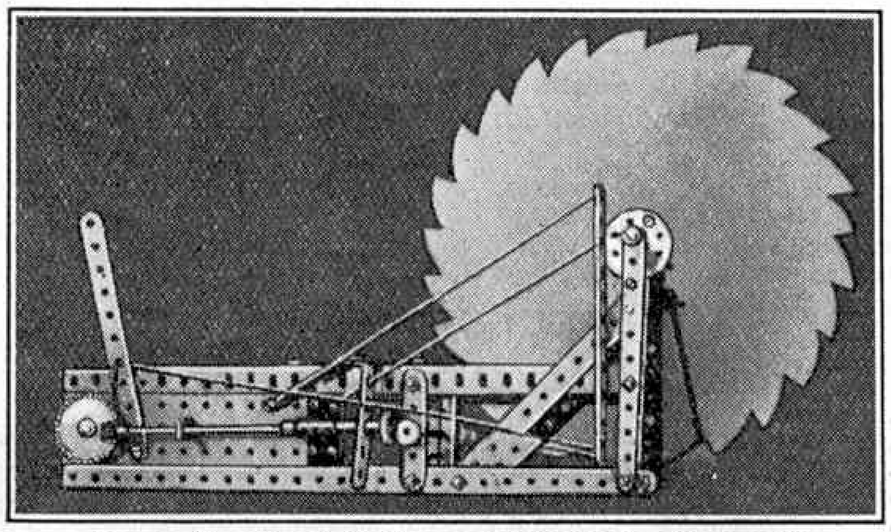
No. 4 Outfit Competition Results

THE No. 4 Meccano Outfit appears to enjoy great popularity with our readers, and its scope of construction, as indicated by the variety of models submitted in this model-building Competition, is certainly remarkable.

I am able to announce the results of Sections A and B in the Competition as follows:—

Section A (Boys under 12):

First Prize (Meccano Products to the value of £2-2s.): G. H. Thomson, 24, Drumsheugh Gardens, Edinburgh. Second Prize (Meccano products to the value of £1-1s.): T. Bass, 127, Walsall Road, Darlaston, S. Staffs. Third Prize (Meccano products to the value of 10/6): N. S. Thomson, 40, Church Road, Moseley, Birmingham.



Circular Saw, by G. H. Thomson (First Prize, Section A)

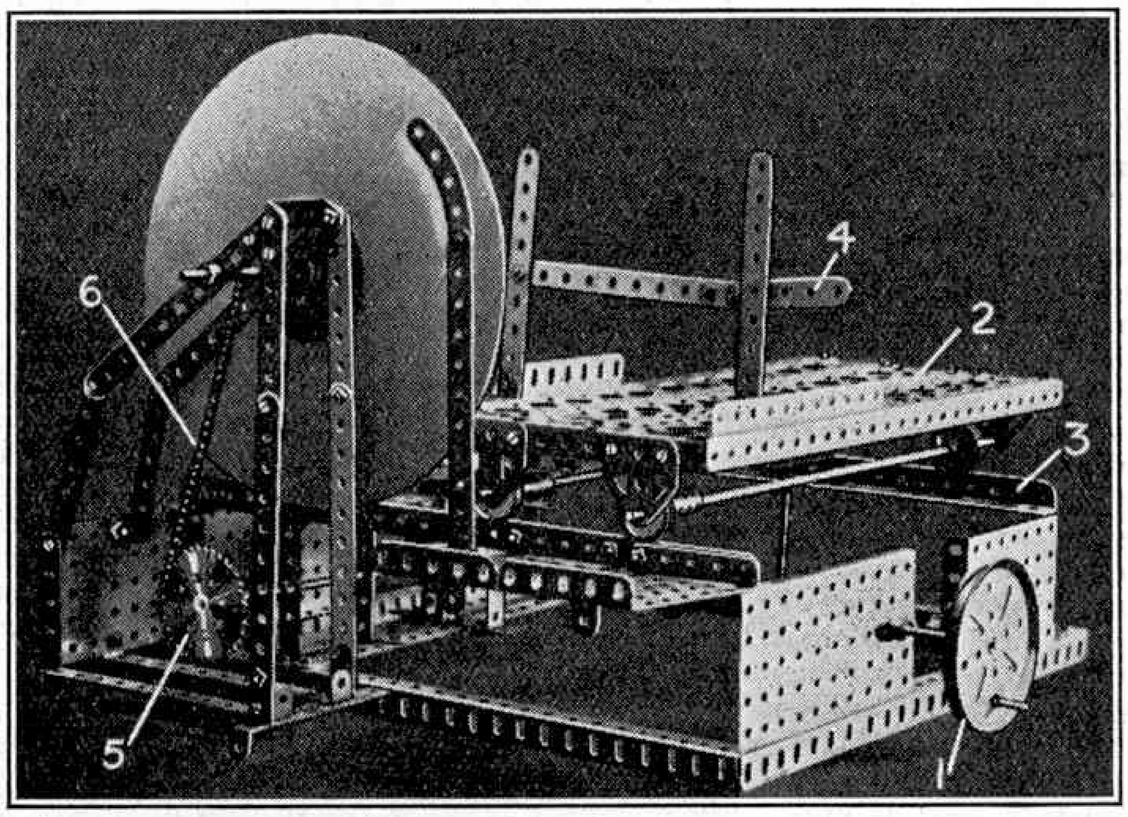
Consolation Prizes (Certificate of Merit and Standard Mechanisms Manual): K. W. Adams, Wallasey; I. Macalister, Helensburgh; M. Badams, Defford, Nr. Worcester; R. S. Bailey, Luton, Beds.; I. M. Sutherland, Rushden, Northants.

Section B (boys over 12 and under 16):

Prizes same as in Section A. First Prize: Alan Mathews, Main Street, Portarlington, Ireland. Second Prize: R. Stokes, 147, Moscow Drive, Liverpool. Third Prize: A. M. Coneybeare, 157, Huntingdon Road, Cambridge.

Consolation Prizes (Certificate of Merit and Standard Mechanisms Manual): J. Plenderleith, East Sheen, S.W.14; L. S. Piggott, Ealing, W.5; A. Turner, Grays, Essex; J. Wilson, Brinsley, Notts.; William Airey, Princes Avenue, Liverpool; W. H. Lenthall, Wandsworth, S.W.18; V. E. Lead, Acton, W.3; A. Cort, Blackburn; P. Aspinall, Darwen; L. Gregg, Long Eaton, Derbyshire; L. Hounsell, Southampton; P. Higgon, Hallen, Henbury, Nr. Bristol.

Special Commendation: J. K. and N. S. Wheatley, Claygate; J. J. Elam, London, E.11; S. G. Barker, London, E.3.; J. White, Peterfield; D. D. Leitch, Greenock; and R. F. Pearce, Erdington, Birmingham.



Bacon-slicing Machine, by A. Mathews (First Prize, Section B)

In addition to the above, further Certificates of Merit have been presented to competitors who sent in models showing particular merit.

The Prize-Winners

The first illustration on this page represents the model Saw-mill which secured First Prize in Section A for G. H. Thomson, who built the model at the age of 9. The circular saw blade is cut out from a sheet of tin and is operated from a Crank Handle journalled in the end of the gear box, the drive being transmitted by means of Contrate Gears. A friction brake is fitted to control the speed of the saw; this consists of a spring-controlled Meccano Strip which may be caused to press against the shaft of the circular saw on operation of a hand lever.

The second illustration depicts an excellent model sent in by Alan Mathews. It will be seen that this represents a Bacon-slicing Machine. It is constructed entirely from Meccano parts with the exception of the large cutting disc, which is shaped from a stout sheet of cardboard. The hand wheel 1 is mounted on an extended shaft which drives, by means of Contrate Gears, a vertical Rod situated in the further side of the model. This latter Rod carries at its upper end a crank consisting of a 3½" Strip bolted to a Bush Wheel. The end of the 3½" Strip is connected to the travelling carriage 2 by means of another Strip pivoted at either end. The action of the crank causes the carriage to move quickly to and fro on the rails 3. The bacon is clamped in position for cutting on the carriage by means of the arm 4.

A 2" Sprocket Wheel 5 is mounted on a shaft which is driven from the Contrate Wheel secured to the vertical Rod already referred to. This Sprocket Wheel transmits rotary motion to the cutting disc by means of the Sprocket chain 6.

The Second Prize in this Section has been awarded to R. Stokes for a model of a Naval Quick-firing Gun, and I hope to publish further particulars of this at a later date.

A. M. Connybeare secured the Third Prize with a model of a Dredger, or Bucket Conveyor, similar in principle to model No. 702 in the Complete Manual.

The Second and Third Prizes in Section A were secured respectively by a model "Razzle-Dazzle"—a kind of joy-wheel—and a "Meccano Cinema."

Results of Meccano Model-Building Contests

By Frank Hornby

"Bridge" Competition

THE allocation of awards in Section A (British Isles) of the Meccano "Bridge" Model-Building Competition is as follows :—

First Prize (cheque for three guineas) :
William Goodwin, 140, Church Street, Eccles.

Second Prize (cheque for two guineas) :
C. P. Plantin, 36, Pembury Road, Westcliff-on-Sea.

Third Prize (cheque for one guinea) :
Kenneth Matthews, 128, Norbury Court Road, London, S.W.

Prizes of 10/6 each :
L. Gill, Mapperley ; William H. Appleyard, Middlesbrough ; S. de Swart, Kensington, W.14 ; G. W. Constable, Bampton, Devon ; P. A. Wood, Oldham ; K. Wright Cameron, Wallasey.

The following competitors, who are amongst those gaining Certificates of Merit, have been selected as deserving special mention :—

J. E. Lockett, Manchester ; P. H. Blandy, Nottingham ; G. Maddison, London, N.16 ; D. Jenden, Glamorgan ; S. Cook, London, S.W.6 ; D. Harris, Teignmouth ; P. Crewe, Sandown, I.O.W. ; J. Litster, Peebles ; F. R. P. Vinter, York ; V. J. Ruxton, Kirkcaldy ; J. Barker, Manchester ; R. G. Stunell, London, S.E.15 ; R. Coombes, South Leigh, Nr. Witney, Oxon ; L. Hollyoak, Coventry ; J. Redfern, Manchester ; G. C. Rumbold, London, N.8.

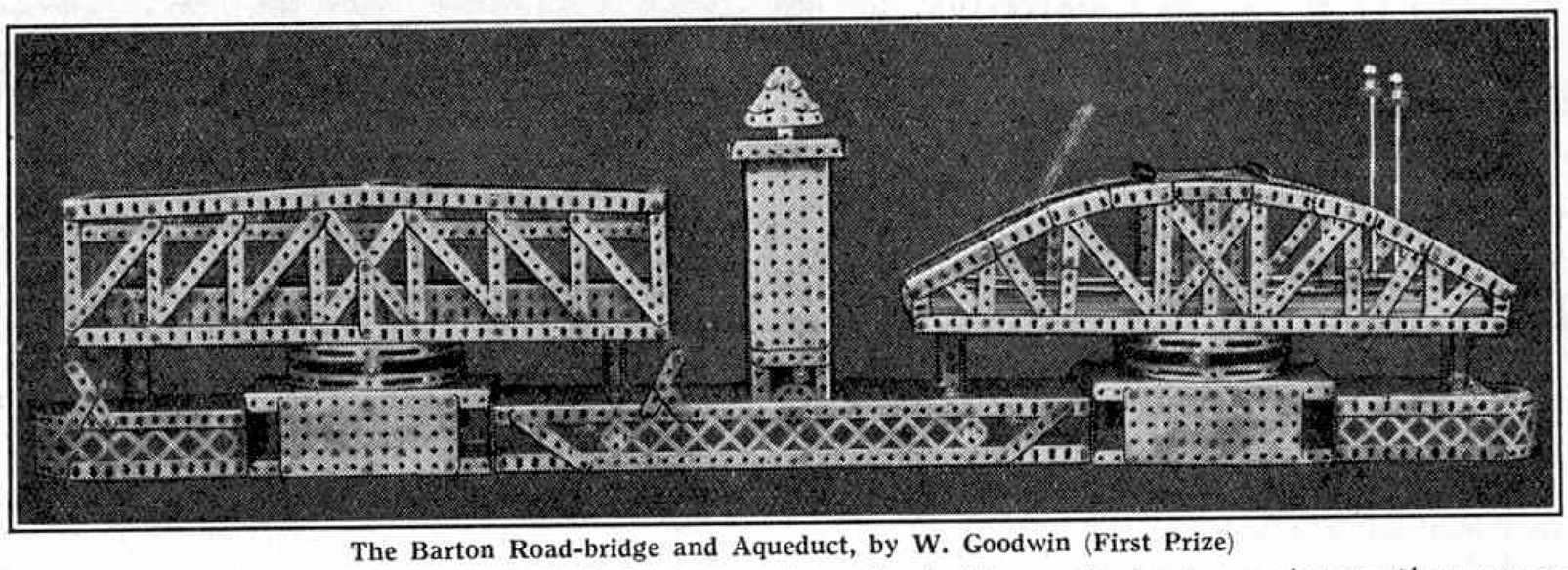
The large and interesting collection of models received in this competition shows that the civil side of engineering may be reproduced in Meccano as realistically as the purely mechanical branch of the science. Some of the models submitted are remarkable both for their symmetry and strength of construction.

The Barton Bridges

William Goodwin's first prize-winning model is illustrated on this page, and some of our readers will be able, no doubt, to recognise in it the famous Barton Bridges, which cross the Manchester Ship Canal at Barton, near Manchester. The revolving bridge on the right of the central tower is used to carry road traffic across the canal, whilst the similar structure on the left is the aqueduct carrying the Bridgwater Canal over the Manchester Ship Canal. The photograph shows both bridge and aqueduct closed to allow ships to pass along the Ship Canal on either side of the central island.

The revolving roadways are each carried on Meccano roller bearings consisting of a series of ½" Pulley Wheels running between two Hub Discs, one of which is bolted to the base of the model while the other is secured to the underside of the rotating structure. The central axis of each bridge is connected to a Meccano Electric Motor incorporated in the base of the look-out tower, and a suitable reduction gear is employed to impart a very slow rotary movement to the bridges.

The latter may be operated separately or simultaneously from the Motor, their movements being controlled by two Dog Clutches which may be thrown in or out of gear by means of hand levers. These may just be discerned in the illustration protruding from the sides of the island on either side of the tower, about mid-way between the latter and the bridge pivot. As the rotating structures swing into their longitudinal positions on the island, they are brought to rest against small spring buffer-stops.



The Barton Road-bridge and Aqueduct, by W. Goodwin (First Prize)

The Chicago Bascule Bridge

The second prize has been won by C. P. Plantin, of Westcliff-on-Sea. Master Plantin's name must be familiar to our readers, for this is the fourth occasion on which he has been successful in carrying off a prize in connection with the model-building competitions, and I congratulate him on the success which his perseverance and skill have gained for him. I may add that Master Plantin is only thirteen years of age, and the models that he has submitted are entirely his own work. His prize-winning model on this occasion is a realistic reproduction of the famous Chicago double-leaf bascule bridge, of which an interesting account appeared in the Meccano Magazine as long ago as January 1924. I am arranging to reproduce photographs of the model in the Magazine shortly.

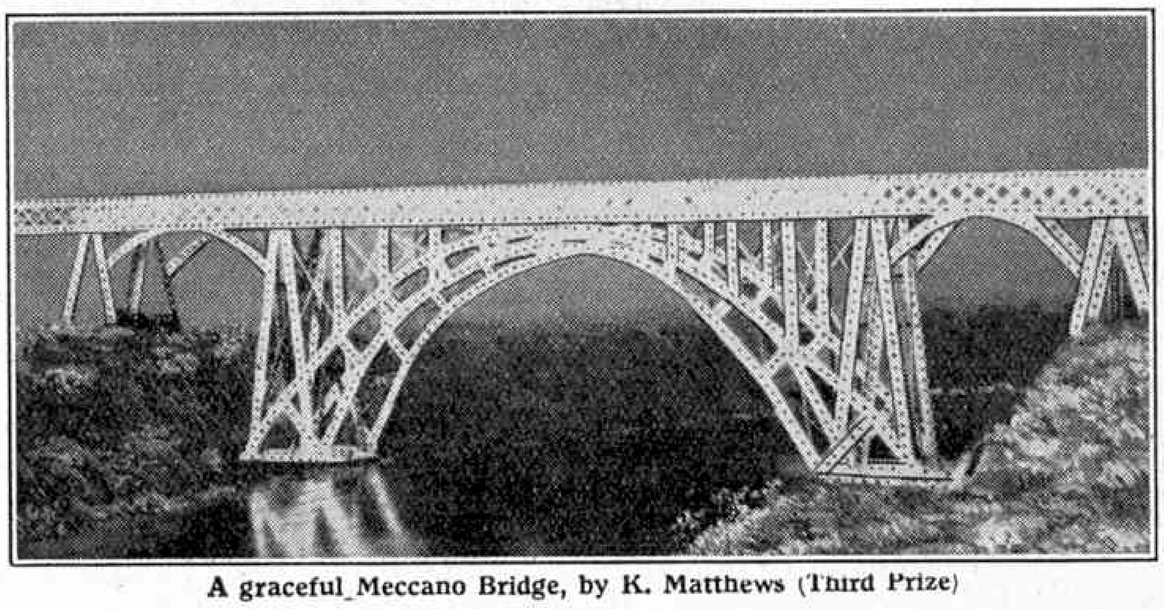
The third prize-winning model, which is illustrated on this page, is a graceful example of Meccano construction. In addition, it is well proportioned and built on scientific principles, although I suspect that, in the opinion of the average Meccano boy, it loses a certain amount of interest from the fact that it comprises no mechanically operated sections.

Other Interesting Models

Two or three competitors submitted models of the famous Hell Gate Bridge at New York, and a particularly neat representation of this structure secured a prize for L. Gill. K. W. Cameron, who has already been successful on more than one occasion in connection with the Model-building Competitions, sent in an imposing design for the new Waterloo Bridge across the Thames. Clever use is made in this model of the Meccano Curved Strips in the construction of a series of graceful arches, and the general appearance of the bridge is enhanced further by the skilful addition of Braced Girders.

Another very ornamental model, representing a double-arch iron viaduct, was built by G. W. Constable. A realistic reproduction of the Niagara cantilever bridge was the work of F. A. Wood, and S. de Swart chose for his subject a typical suspension bridge. Meccano Sprocket Chain takes the place of cables in the latter model, and is slung over the top of the two main towers, while the roadway is suspended along its length by short vertical pieces of cord.

W. H. Appleyard's model is based upon an Australian railway girder bridge. It consists of five spans and measures eight feet from end to end. The majority of the bridges described, especially the swing or bascule type, will add interest to almost any model railway.



A graceful Meccano Bridge, by K. Matthews (Third Prize)

Overseas Model-Building Competition Results

The following are the results of the Overseas "Aeroplane" and "No. 1 Outfit" Meccano Model-building Contests," which comprise the second pair of the series to be published. Models have reached us from all parts of the world, and all are well designed, showing that our readers abroad have a sound knowledge of engineering in general. It was no easy task for the judges to decide upon the winners, but after careful consideration the prizes have been allocated as follows :—

Overseas "Aeroplane" Contest.

First Prize (cheque for £5-5s.) : G. Rappini, Via Piemonte N.63, Rome, Italy; Second Prize (£3-3s.) : M. Allessandro, Vico 1o, Montesanto No. 12, Naples, Italy ; Third Prize (£1-1s.) : Henry E. Albon, Fort Ricasooli, Malti.

Prizes of 10/6 each : R. Jukes, S. Canterbury, New Zealand ; S. W. Lustig, La Plata, Argentine ; A. W. Porter, Hamilton, Ontario, Canada ; R. Russell, Manaia, Taraniki, New Zealand ; T. Scheer, Bodegraven, Holland ; L. Stevenson, Karachi, India.

Special Commendation (Certificate of Merit) : J. Fairclough, P.O. De Deur, Transvaal, South Africa ; F. J. Koot, Rotterdam, Holland ; G. H. Lynkamp, Rotterdam, Holland ; R. A. Nairn, Bassendean, Perth, W. Australia ; E. R. Rawlings, Westmount, Canada ; J. Sharpley, Hastings, Hawkes Bay, New Zealand ; H. Tsumura, Kashiwagi, Tokyo, Japan ; George Fraser, Ohura, New Zealand ; Pierre Renault, Alencon, Orne, France ; Enno Erkelens, Amersfoort, Holland.

Overseas "No. 1 Outfit" Contest.

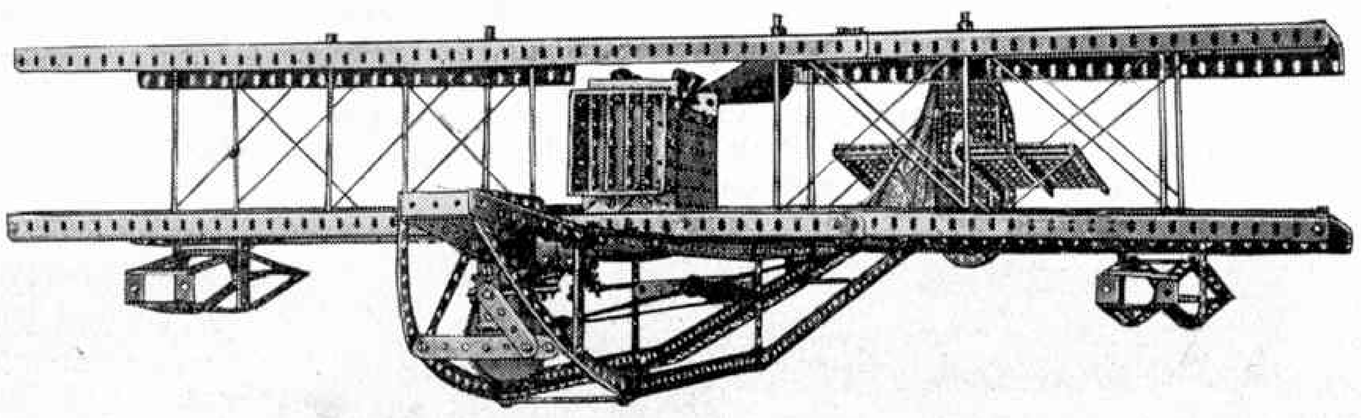
First Prize (Meccano products to value of £2-2s.) : H. L. Boxill, 16, Hunter Street, Woodbrook, Port-of-Spain, Trinidad, B.W.I. ; Second Prize (Meccano products to value of £1 1s.) : A. Luke, 75, Wade Street, Wadestown, Wellington, New Zealand ; Third Prize (Meccano products to value of 10/6) : W. A. T. de Souza, 120, Daisy Villa Avenue, Bambalapituja, Colombo, Ceylon.

Special Commendation (Certificate of Merit) : L. M. Bollen, Utrecht, Holland ; J. C. Forwell, Cremorne, Sydney, N.S.W. ; W. M. Flanderha, Bambalapitiya, Colombo, Ceylon ; D. S. Framji, Mota Falia, Navsari, India ; E. and W. G. Holder, Port-of-Spain, Trinidad, B.W.I. ; F. Lazarom, Voorburg, Holland ; Ch. Mal, Delhi, India ; R. Maiden, Marton, New Zealand ; R. E. McGee, Hamilton, Ontario, Canada ; G. A. Rockwood, Colombo, Ceylon ; L. Mauger, Balingup, W. Australia.

A Meccano Hydroplane

A good model of a "de Pinedo" hydroplane secures First Prize for G. Rappini in the Overseas Aeroplane Contest. The rudder in this model is secured to a vertical axle attached to the tail fin. It may be rotated from the steering gear situated in the pilot's cockpit, the necessary connections consisting of Bevel Gears and a long Rod which passes from end to end of the fuselage. Further control connections to the cockpit are carried out by means of wire.

The shape of the fuselage closely approaches the real "de Pinedo" machine. An interesting feature of the model is the position of the engine, the propeller of which rotates at the rear of the upper main wing, thus denoting the aeroplane to be of the "pusher" type. The V-type engine is cleverly imitated. The watercooled radiator is placed in front of the aeroplane and consists of a square frame built up from Strips, with vertical $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips representing the cooling tubes. The motor-bed is formed by $3\frac{1}{2}'' \times 2\frac{1}{2}''$ Perforated Flanged Plates. The main wings are entirely covered by $12\frac{1}{2}''$ Strips, and the struts consist of twelve Axle Rods mounted in a vertical position between the wings, while diagonal lengths of cord represent the tie-members. Realistic floats are attached beneath each end of the lower wing.



"De Pinedo" Hydroplane, by G. Rappini (Awarded First Prize, Overseas "Aeroplane" Contest)
It will be noted that this machine is of the "pusher" air-screw type

A Famous Aeroplane

The Second Prize has been won by Mattei Allessandro, who submitted a model of the "Dornier Wal" monoplane, a reproduction of which appeared on the cover of last month's *"M.M."* A four-volt Electric Motor is mounted in the upper wing of this model, and transmits power to a four-bladed propeller constructed from two $5\frac{1}{2}''$ Strips and a Bush Wheel.

An excellent model of the "Wee Bee I." monoplane secures Third Prize for H. E. Albon. Other prize-winning entries include models of bombing biplanes, passenger machines with folding wings, triplanes, chasing 'planes, de Havilland "Moths," Handley-Page air liners, and the "Auto-Giro" and other types. All these models reflect the skill and imagination employed in their construction, as well as many patient hours of work.

No. 1 Outfit Contest

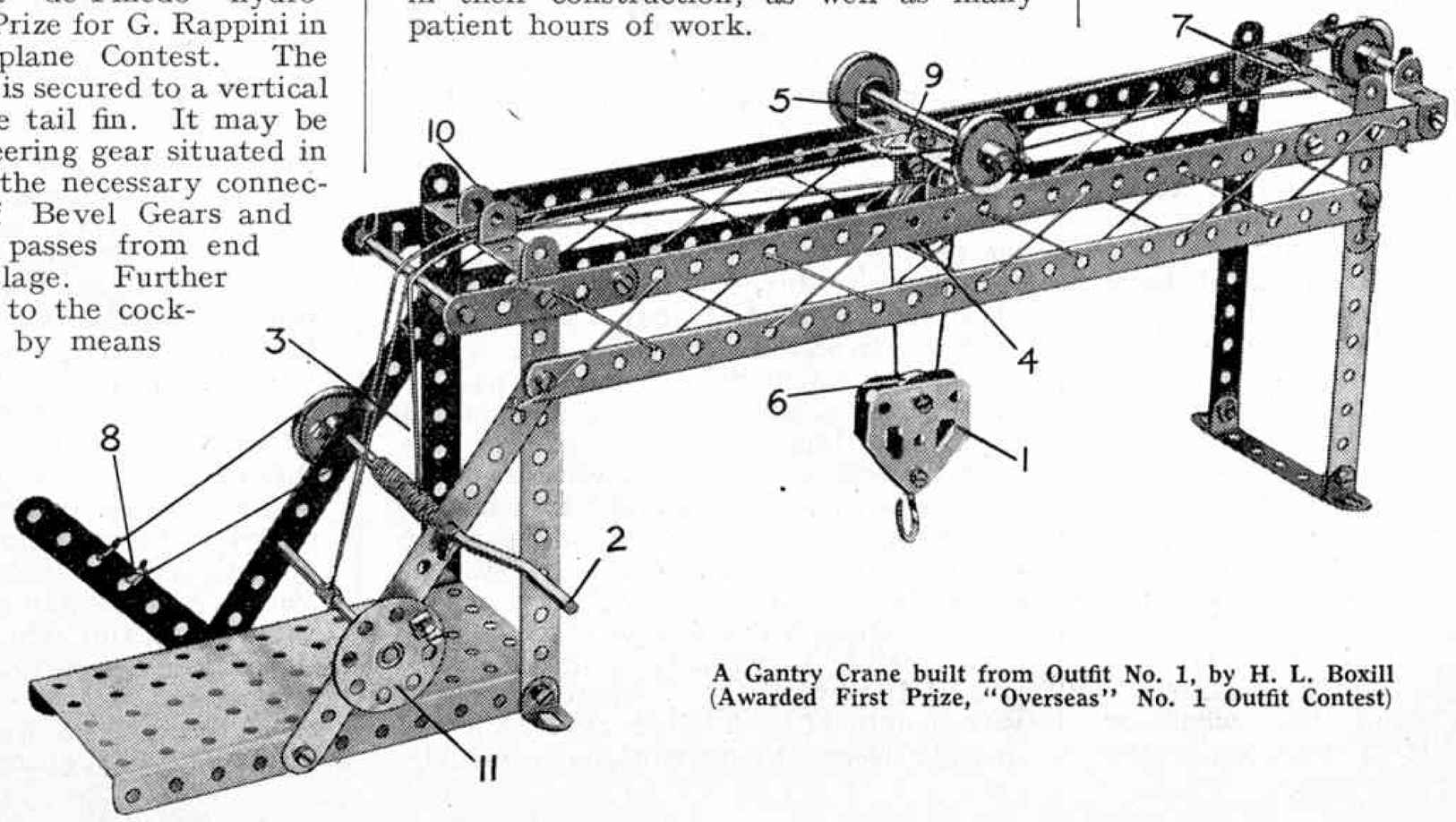
Some very interesting and novel entries were received in this competition, and following my usual practice, I shall endeavour to reproduce one or two that show a particularly high standard of merit in future Instruction Manuals.

The First Prize has been awarded to H. Boxill for the neat Gantry Crane illustrated below. This is certainly a clever example of the capabilities of a No. 1 Outfit, and I am appending a few particulars of the construction of the model, as many readers may wish to set it up for themselves.

The pulley-block 1 is raised or lowered by means of the Crank Handle 2, on which a cord 3 is wound. This cord passes over one of the two loose 1" Pulleys 4 carried on a short Rod, which is journalled in the ends of Flat Brackets suspended by means of a Double Bracket beneath the Double Angle Strip 5 forming the frame of the trolley. The cord then passes round the $\frac{1}{2}''$ Pulley Wheel 6 in the pulley block, and round the second of the Pulley Wheels 4, and is finally fixed to the model at 7. A friction brake 8 is provided to control the hoisting cord (see Meccano Standard Mechanism No. 81).

A Variety of Models

The traversing movement of the trolley is affected as follows :—A length of cord tied to one of the two Flat Brackets 9 is passed round the 1" Pulley Wheel at the outer end of the gantry, and then led back under the axle of the trolley, over the guide 10 (consisting of a Double Bracket) and wound on to a $3\frac{1}{2}''$ Axle Rod. The latter may be operated by a hand wheel 11, formed from a Bush Wheel and $\frac{3}{8}''$ Bolt. After passing several times round the $3\frac{1}{2}''$ Rod the cord is returned over the Double Bracket 10, and its end is secured to the second of the two Flat Brackets 9, which are bolted to the centre of the Double Angle Strip 5.



A Gantry Crane built from Outfit No. 1, by H. L. Boxill
(Awarded First Prize, "Overseas" No. 1 Outfit Contest)

Amongst other interesting models entered in this competition I noticed many different types of cranes, a pile-driver, fret saw, aeroplanes, trench mortar, tipping motor wagon, guns, helicopters, motors, tram-cars, and a steam hammer. I hope to deal with one or two of these in detail in the *"M.M."* when space permits.

Ship to Shore Wireless Telephony Tests

By Derek Shannon

This is an article by the inventor of a new and successful wireless telephony apparatus, which was recently tested from a Channel Islands steamer belonging to the Great Western Railway Company, by whose permission the following is published.—EDITOR.

I HAVE been asked by the Editor to tell you something about the experiments and tests that I recently carried out in "ship to shore" wireless telephony in conjunction with the Great Western Railway Company. I will endeavour to relate what we actually did and how it came about.

To begin with I must take you back a few years, in fact to the year 1912, when I was inspired by an article in a daily paper to take up the study of wireless telegraphy. My first efforts in this direction were not very successful, for after constructing a rather crude set, I duly laid the aerial and earth "lead in" wires in the recognized "electric bell" fashion, and neatly stapled them to the floor over a length of about 30 ft. After listening vainly for signals for about a week, I came to the conclusion that I had made some mistake.

The Author with the Duplex Telephonic Set used for his Tests on board the "*Reindeer*"

At this time we had no wireless magazines or papers telling us what to do or what not to do—in fact very few people knew anything about wireless. However, the same week I was introduced to a fellow enthusiast in wireless experimental work. I explained my difficulties to him, and he soon put me on the right track. I rectified my various faults, and one sunny afternoon in June of what was to me a memorable year, I had my first experience of listening to a message carried only by that invisible and intangible medium, the ether. Never shall I forget that first thrill, as I listened with bated breath, nor my disappointment when that message ended. Since that day I have heard voices speaking over 5,000 miles away, but it leaves me cold by comparison with that first almost inaudible scratching of the morse code from a station only eighteen miles distant.

From that crude beginning I progressed, and gradually, as I learned more of the subject, I improved my apparatus. One day a friend who was listening-in with me, after hearing a few messages, made the astonishing suggestion that it might be possible in years to come for a man to carry with him a small portable instrument and to talk to his friends from wherever he happened to be. I was so struck with the idea that after a time I commenced to work on it, but owing to the extreme insensitivity of the apparatus then in vogue, I made but very little headway. However, with the advent of the valve, with its wonderful amplifying powers, I began to progress, and gradually have succeeded in evolving an apparatus, which is, I think, a very close approach to my friend's suggestion.

In the first place, it is portable, and does not require the use of an aerial or earth to operate on either the transmitter or the receiver. Neither does it require much power to work it, as you will see later. This apparatus had practically reached laboratory perfection two years ago, but owing to the restrictions imposed by the Wireless Telegraphy Act on amateur experimental transmission, together with the restricted hours that an amateur experimenter has at his disposal owing to the advent of broadcasting, I had not, up to a few weeks ago, been able to test very much outside the laboratory. However, I have since obtained the necessary second transmitting licence which enables me to carry out duplex telephony tests.

Perhaps at this juncture, for the benefit of the uninitiated, I may explain what duplex wireless telephony is. It is the method by which two persons are able to converse at a distance, both speaking at the same time. Hitherto this has not been possible in the case of wireless owing to the fact that an ordinary transmitter, if worked near to a receiver, will paralyse the latter completely. With my system, owing to the extreme selectivity of the receiver through the absence of any aerial, it is possible to work close up against a powerful transmitter, even though the wave-length of each differ by only a few metres. Hence duplex working is possible.

Therefore having obtained the necessary permission, I approached the Great Western Railway Company, and asked their help in carrying out tests from their trains and Channel Islands boat services. With their usual enterprise they entered into the spirit of the thing with enthusiasm. In a few days they granted all the necessary facilities and placed everything needful at my disposal.

Early in January I and my assistant, with our apparatus, caught the 11.30 a.m. train from Birmingham to Weymouth. After being joined by a representative of the G.W.R. Publicity Department at Westbury, we got out the portable receiver as the train passed Castle Cary, as broadcasting was then just commencing. Immediately we picked up the Bournemouth B.B.C. station at a distance of about 85 miles. The train, I suppose, would be travelling at about 50 miles an hour at the time, and Bournemouth came through at excellent strength. We then tuned in to "2LO," about 125 miles away. That, too, came through at full strength and was held until arrival at Weymouth. Here we joined the S.S. "*Reindeer*," whose captain was instrumental in making everything smooth for our tests, except the sea!

Early next morning we arrived at St. Peter Port, that quaint little Guernsey town, which has an almost foreign appearance in its picturesqueness, and here we decided to start our tests. For this purpose we left one set of instruments at the G.W.R. agent's office in St. Peter Port, while we took the other set out to the Forest, a parish about five miles away. It was then learnt what a bad reputation St. Peter Port had for wireless reception. We were told tales of wireless installations that had been put in by well-known persons and removed for various reasons, so that it was with some anxiety that I made my preliminary test from Forest to St. Peter Port. Immediately I switched on, the voice came through clear and strong, so that I knew then that I had nothing else to fear, and that my instruments had stood the vibration of the journey all right.

The next day, in company with a G.W.R.

representative, I again joined the "*Reindeer*" on her way to Weymouth, taking with me one of the sets, the other set remaining at the Forest. At first we had a slight mechanical fault in the receiver, but after about 20 minutes this was rectified and we commenced our tests. At half-past eleven we were able to exchange telephonic conversation. The input to the transmitters on this occasion was the extraordinarily low power of only five watts—a power so low that if it was passed through an ordinary electric light meter the latter would not record it.

At this juncture the wireless operator on the ship made a very interesting experiment by transmitting two messages on his half kilowatt spark transmitter, and although our instrument was only a few yards from his aerial, and only separated by a few metres in wave-length from that on which our own receiver was working, we experienced no interference whatever, which, I think, goes to prove how extremely selective my instrument is. We learnt a great deal from this test—mainly technical information that we could not otherwise have obtained in purely laboratory experiments, as we were then working under the exact conditions for which the instruments were designed.

On my return to the Channel Islands the following day I proceeded to Jersey with the "*Reindeer*," and again we were able to keep in telephonic communication between the boat and Forest. Considering that this was our first test of this kind, we were delighted with the results achieved.

Now, as I do not want to take up too much space, I will conclude with a brief description of the instruments used in these tests. The transmitter is contained in a case 2 ft. in length, by 10 in. in width, by 1 ft., and that containing the receiver measures 1 ft. by 10 in. in length, by 6 in. in width. The transmitter complete weighs no more than 20 lb., and the weight of the receiver is only 18 lb. The power for carrying out these tests was supplied from dry batteries only. You will understand that these are only rough laboratory instruments, and in practice they can be much reduced in size—in fact, the commercial article would most likely be combined in one case weighing about 30 lb. The microphone and receiver are the identical type used in an ordinary 'phone, and you speak exactly as you do when using the 'phone, and with the same ease. The advantages claimed for this system are as follows :—

(1) This is at present the only known method of duplex wireless telephony.

(2) No radiation takes place with the receiver, and even if other circuits are radiating in close proximity, no interference is experienced, this being mainly due to the absence of any aerial.

(3) Use of the apparatus enables the ordinary shore or land telephone to be "plugged in" through the telephone exchange switchboard, and telephone conversation can then be carried out between a telephone subscriber and a friend on board steamer.

(4) The selectivity is very great, and as it can be operated on extremely low wave-lengths, a great number of stations can be accommodated on a very few metres wave-band.

(5) Greater economy in input power for a given distance is possible than has hitherto been heard of.

I cannot at the moment go into the actual technical explanation of "how it works," but I can say to anyone who feels he would like a peep inside the box that he would be extremely surprised at its simplicity. Although it accomplishes so much, the fundamental principle is very simple, and many of the same parts as are employed in a standard set would at once be recognised.

In conclusion, I would like to pay a tribute to all the officials of the Great Western Railway Company with whom I came in contact, for in every way possible they gave me the greatest help and laid themselves out to make these tests a success. Wherever I went and all whom I met—all were imbued with the same spirit of enthusiasm for the success of the experiment. I feel that if the wireless trade in general and certain of the wireless journals always gave the same assistance to the amateur experimenter as the Great Western Railway Company gave to me, wireless science would have been in a much more advanced state than it is even at the present time.

28th Photographic Contest

It has been said that old favourites are best, and with the popularity of our July contest last year in mind, we have decided to set a similar subject for our photographic contest this month. Last year's title was "A Happy Holiday Scene," but as very many of our readers do not commence their holidays until very late in the month, the contest this year will not be restricted to a holiday scene but will be covered by the one word "Happiness."

The scope of a competition with this title is unlimited, for wherever we go we can find happiness expressed in some way or another. In the town or at the seaside, on the sports field or in the garden, opportunities will present themselves.

The special point to be borne in mind is that the prizes will not necessarily be awarded to the senders of the most technically perfect prints. The awards will go to the photographs that best depict the spirit of happiness.

The usual prizes of photographic materials or Meccano products to the value of £1 1s. and 10/6 respectively will be awarded to the first and second prize-winners in each of the usual two sections, A for those of 16 and over, B for those under 16. Prints must be marked on the back with the competitor's name, address and age.

Closing date: 31st July: Overseas, 30th November.

26th Photo Contest Result

This contest, the subject of which was "Reflections," produced a splendid entry and many excellent photographs. As was to be expected, perhaps, in a contest in which water played so large a part, several competitors spoiled their prints by omitting to trim them straight, and as a consequence there were several examples of rivers and streams heeling over or flowing uphill! Fortunately the best prints did not fall within this category and the final result was in no way affected.

The awards were as follows :—

FIRST PRIZES—Section A, R. W. JARDINE (Wallasey); Section B, H. V. MORRIS (Rotherham). SECOND PRIZES—Section A, W. E. SMITH (Liverpool); Section B, C. HAYWARD (West Malvern).

Reply to Query

FILMPACK SIZES.—The correct size filmpack to fit a $3\frac{1}{2} \times 2\frac{1}{2}$ camera is $3\frac{1}{4} \times 2\frac{1}{4}$, and any photographic dealer will supply you. Our experience of filmpacks has been satisfactory but we strongly advise you to use only British-made products and a reliable filmpack adaptor. Most of the complaints made against filmpacks can be traced to a failure to observe those points. (*Reply to S. T. Franks, Goole*).

"Originality" Competition

Prizes Offered for Good Ideas

The type of model to be submitted in this interesting model-building competition, the first announcement of which appeared in last month's "*M.M.*," depends entirely on our readers' imagination or personal inclination. The prizes will be awarded to the competitors whose efforts are considered to possess the most original features, either with regard to the type of apparatus that they represent or to the novel uses of Meccano parts or movements that they employ. Any kind of apparatus may be submitted in the competition, but it is important to remember that the winning feature will be novelty. All models submitted in the competition must be the competitor's own unaided work both in design and construction. Any Outfit or number of parts may be used.

The competition closes on the 31st August for readers in the British Isles, and entries from overseas competitors must be received by 30th November, 1926. Competitors should send along their efforts as soon as they are completed.

Entries will be divided into the following sections : Section A, for competitors residing in the British Isles ; Section B, for competitors residing outside the British Isles. Competitors' ages will be taken into consideration when judging the entries. Prizes will be awarded for the best entries FROM EACH SECTION as follows :—First Prize, £3-3s. ; Second Prize, £2-2s. ; Third Prize, £1-1s. ; Six Prizes of 10/6 each. A few special Certificates of Merit and complimentary copies of "Meccano Standard Mechanisms" will be awarded at the judges' discretion.

Competitors should send in photographs or drawings of their models, together with any necessary explanations, although the latter should be as brief as possible. Photographs or drawings will be returned if a stamped and addressed envelope of the necessary size is enclosed with the entry. The competitor's name, address, and age must appear on the back of each sheet used, together with the name of the competition and section in which the model is entered. Envelopes must be marked "Originality Competition"

"Selected Parts" Competition

As a variation to our recent "Outfit" Competitions we announced in last month's "*M.M.*" a contest in which the models submitted must be constructed from the Accessory Parts included in the following list :—

4 of No. 1	2 of No. 17	52 of No. 37
8 " " 2	2 " " 18A	6 " " 38
8 " " 5	1 " " 19	1 " " 45
2 " " 8	4 " " 20	6 " " 48A
2 " " 10	4 " " 22	1 " " 52
2 " " 11	2 " " 22A	1 " " 62
4 " " 12	1 " " 23	1 " " 115
2 " " 15	1 " " 24	2 " " 125
4 " " 16	8 " " 35	2 " " 126A

Each part shown in the list must be used, and none may be added. Competitors may construct any type of model that they prefer, but it should be as original as possible. A model submitted for consideration must be the competitor's own unaided work both in design and construction.

Entries will be divided into three sections—Section A, for boys under 12 years of age ; Section B, for boys over 12 years of age ; Section C, for boys residing overseas. Prizes consisting of Meccano products to the value of two guineas, one guinea, and half-a-guinea respectively will be awarded for the three best entries in each section, and in addition certain consolation prizes will be distributed.

Closing dates, for Sections A and B, 31st August Section C, 30th November, 1926.

Having constructed some Meccano contrivance from the parts shown above, you should send in a photograph or good drawing of your model, together with any necessary explanations, although the latter should be as brief as possible.

Write "Selected Parts Competition," together with your name and address, on the back of each photograph or sheet of paper used, and state your age. Mark envelopes : "Selected Parts Competition."

Competition Closing Dates

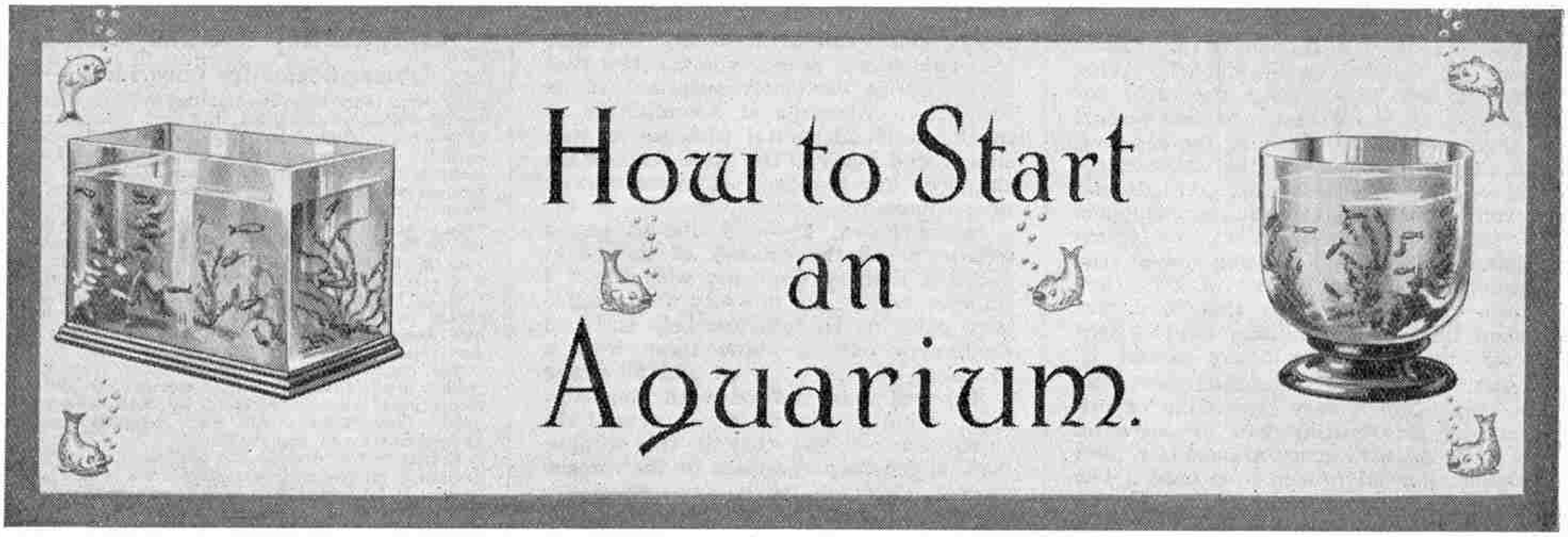
"No. 5 Outfit" Competition : entries from any country outside the British Isles must reach Liverpool not later than 31st August, 1926. Closed for United Kingdom entrants. Full particulars in "*M.M.*" for April, 1926.

"Crane" Competition : entries from any country outside the British Isles must reach Liverpool not later than 30th September. Closed for United Kingdom entrants. Full particulars in "*M.M.*" for April, 1926.

"Utility" Competition : entries from any country outside the British Isles must reach Liverpool not later than 30th October. Closed for United Kingdom entrants. Full particulars in "*M.M.*" for May, 1926.

"Machine Tool" Competition : entries from any part of British Isles must reach this office on or before 31st July. Overseas section closes 30th October. Full particulars in "*M.M.*" for May, 1926.

For "Tippler" Competition Results, see page 455



By W. COLES-FINCH
(Resident Engineer, Chatham etc. Water Co.)

MORE POND INSECTS

THE life-histories of some of the more prominent pond insects were described last month. There are a few other pond creatures, however, of such interest that they must not be overlooked. Among these is the familiar Gnat.

The Unpopular Gnat

The Gnat cannot be regarded as by any means a popular creature and indeed many people cherish for it a deadly hatred. It certainly is a near relative of the mosquito but it has not the latter's objectionable habit of conveying disease. We frequently speak of "gnat bites," but as a matter of fact gnats do not bite, neither do they sting, and it is only the females who can do any damage at all for the males are perfectly harmless.

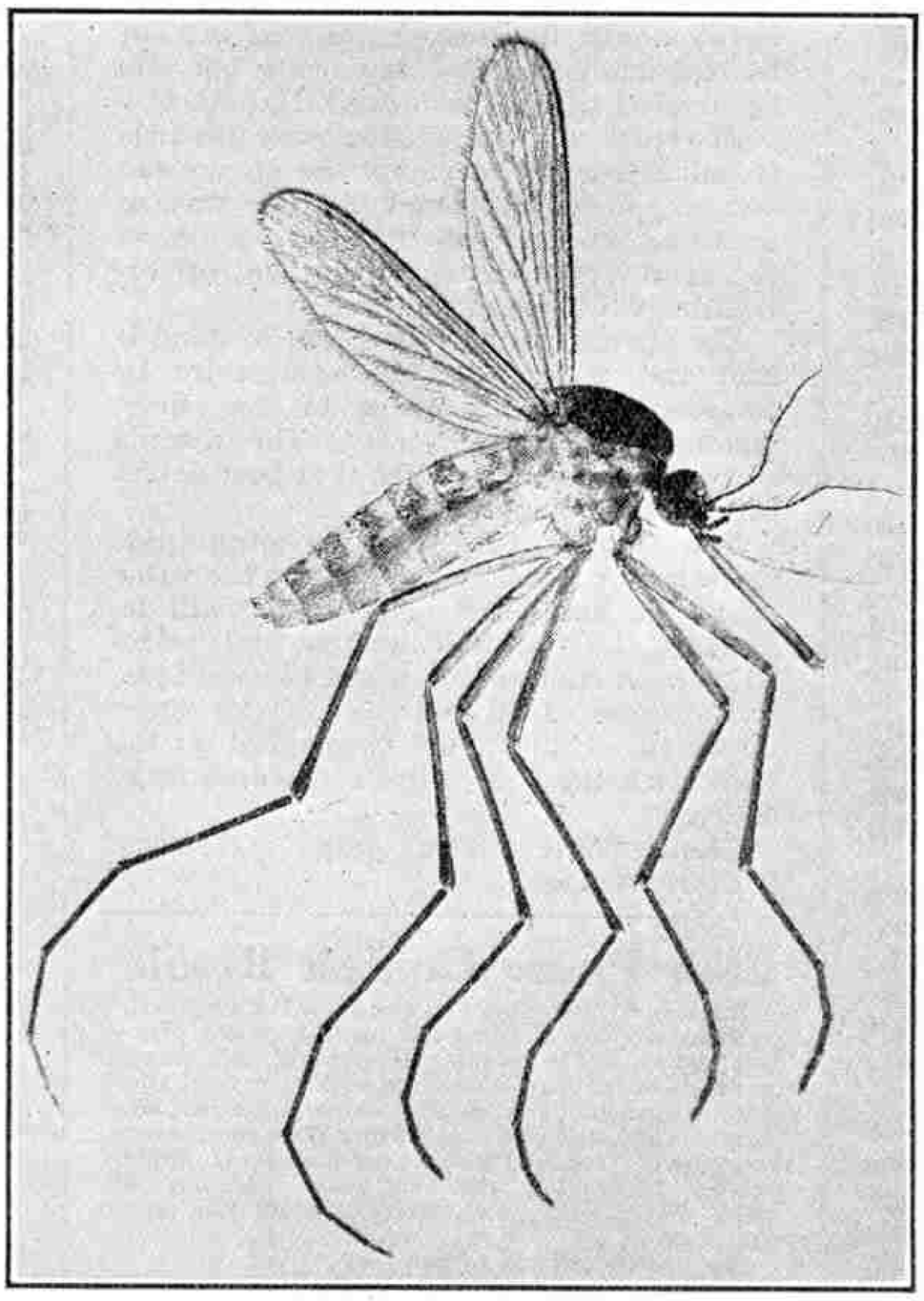
It certainly appears to be a fact that the female gnat has a great liking for human blood, and many of us know to our sorrow how persistent she is in her attentions when she is on the lookout for a meal.

An Engineering Operation

The methods by which the female gnat obtains her meal may fairly be regarded as an engineering operation. First of all, undeterred by all our waving of caps, newspapers or any other weapons that may be handy, she selects a tender place for her operation, settles upon it, and quickly makes an incision by means of her boring apparatus. The hole thus produced is not yet large enough for her purpose and so she sets to work with an implement that may be described as a minute saw, and enlarges the hole. Having obtained the necessary diameter she then inserts a tube through which she extracts the blood of her victim.

The effects of attack by gnats vary greatly with different individuals but in every case the resulting pain and swelling is not due to any kind of poison injected by the creatures, but to irritation caused by the engineering operations just described.

The life-history of the gnat is very interesting. The female when laying her eggs settles on a piece of floating stick, leaf or grass, and builds up the eggs into a sort of raft by joining each egg to the next by a sticky substance. The raft may consist of from one hundred to three hundred eggs and it is so perfectly arranged and balanced that it is unaffected by even the most violent disturbance of the water. Showers of rain will not sink it and if it is deliberately pushed below the surface of the water it rises again immediately. The eggs, which are shaped something like a cigar, hatch in a few days. A tiny door in the egg then opens and the gnat larva drops out into the water below.



The Gnat as seen through the Microscope

A Curious Creature

The gnat larva is a curious looking little creature. It is not entirely aquatic but is dependent on atmospheric air. It breathes in a very peculiar manner, and Bateman in his book "Fresh-Water Aquaria" describes the process as follows:—"This breathing arrangement consists of a small tube which is fixed to the eighth segment of the body. When the creature wishes to take in a fresh supply of air, it protrudes the end of this tube above the surface of the water, and the bristles which guard the orifice open in a star-like fashion, admit the air, and close again to prevent the ingress of the water as the larva with its extraordinary motion dives down again to the bottom of the pond, ditch or tub. . . These creatures swim by alternately straightening and bending their bodies. They never seem to make any journeys except those between the bottom of the water and its surface.

"If one should go, during warm and sunny weather, cautiously to the side of some old tub or butt, full of water, he will most likely see several of these larvæ busily taking in fresh supplies of air, but directly they notice any movement upon the observer's part they will wriggle and jerk their way down to the bottom out of sight."

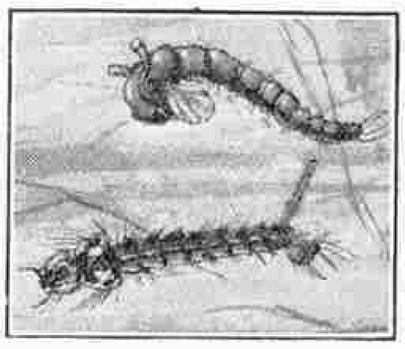
The larvæ are useful in devouring decaying matter in the water and are useful as food for other aquatic creatures.

During the three or four months that elapse before the gnat larva turns into a pupa it undergoes several moults. The pupa is a curious, top-heavy creature. It swims about by means of a series of jerks, but takes no food. Presently it comes to the surface, the pupa case splits and the perfect gnat emerges and, after a short rest on the floating skin in order to dry its wings it takes to flight—possibly to the subsequent annoyance of some unfortunate human being in the vicinity!

We now come to another creature which has rather a bad reputation—the Midge. Like the gnats, these insects spend the

larval and pupal stages of their lives in water. Midges generally are very gnat-like in appearance and this is particularly the case with members of the genus *Corethra*.

The Phantom Larva

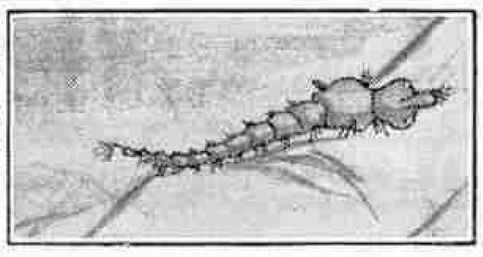


Above: Pupa of Gnat
Below: Larva of Gnat

Corethra plumicorus is particularly interesting on account of its really extraordinary larva. This is frequently referred to as the "phantom" larva and the name is extremely suitable. The creature is so transparent that it is very difficult to see it in the water and it is extremely restless, continually reversing itself, so as to face in the opposite direction, with almost incredible speed. Apparently it makes use of its transparency in order to capture its prey.

This larva is of great interest for microscopic examination as, on account of its transparency, the digestive canal, heart and other internal arrangements may be plainly seen. The pupa resembles that of the gnat.

In the course of our pond hunting we shall come across a red worm-like creature continually twisting itself about as it wriggles through the water. This is the larva of another gnat-like insect *Chiromonsus plumosus* and it is familiar to anglers as the "blood worm." This creature builds for itself, with remarkable speed, a little house of decaying vegetable matter, mud, etc. Its career is unique in many respects and the following description from "Pond Life"* by Mr. E. C. Ash is well worth quoting:—



Phantom Larva of Corethra

A Peep into Larva-land

"Life among these little worms is one of activity, for some of the members are always either making or leaving a home. It often happens that a larva settles near to a burrow tenanted by another member of its family. Then a most amusing incident occurs, the newcomer gradually makes its way in, whilst the owner most unwillingly makes its way out, and probably fearing that the visitor is purely on business bent, hesitates not but swims away to a fresh spot, where it either plays the same game on some other unfortunate larva, or else rapidly weaves a few pieces of mud and decaying leaves together to form a fresh home. If a large number of these larvæ are present in a small pool they will gradually arrange the mud in so many little heaps that give a most curious effect.

"While at home they are by no means sleeping, but are continually undulating so as to produce a constant stream of water through their habitat, and at times they vary the monotony by pushing their tail-end out and waving it to and fro, in order to obtain any free oxygen that is present in the surrounding water. Every now and again the head end makes its appearance, and after making a quiet survey of the neighbourhood and having collected any mud that it may require by means of its clawed feet, withdraws again."

* "The People's Books," T. C. & E. C. Jack

An Aquatic Caterpillar

Most collectors have come across at some time or other a creature neatly wrapped up in a garment of leaves or pieces of some aquatic plant, and resembling to some extent a Caddis worm. This is the caterpillar of the "China Mark" moth and it holds the proud position of being the only moth caterpillar that is aquatic.

Water Caterpillar of China Mark

The larvæ eat their way into the plant upon which they are hatched and set to work to make a home for themselves by joining together pieces of its leaves. It is very interesting to know that, as the creature grows larger, it effects a corresponding enlargement of its house, and also carries out any repairs that may become necessary!

The "China Mark" moths are quite small, the largest species measuring only about one inch across its fully extended wings, which are white with markings of brown, yellow or black.

The May-fly

The most delicate and graceful of all pond insects is the May-fly, and there is no more interesting sight than a swarm of them dancing, rising and falling regularly and ceaselessly with every appearance of keen enjoyment. These beautiful insects usually have two pairs of wings, one large and the other small, and the body terminates in two or three slender tails. Very curiously they do not possess a mouth and are therefore incapable of taking food of any kind.

Larva of May-fly

Possibly no other insect has to face so many dangers in the course of its brief career. Fishes regard the May-fly as the very daintiest of food and this opinion appears to be shared to a great extent by insectivorous birds of all kinds.

The female lays her eggs upon the surface of the water and these sink to the bottom among stones and weeds. Both the larva and pupa of the May-fly may be kept in a small aquarium and their interesting metamorphosis may then be watched.

Pond Skaters

There are also the Pond Skaters, *Gerridae*, those little creatures that skim so quickly the surface of our pools, and which offer a mystery for our unravelling. They are poised on four small and delicate feet covered with fine velvety hairs which, in spite of all we know of the laws of buoyancy and displacement, support their entire weight, enabling their body to be propelled with great speed clear above the surface of the water. The only indication of displacement of water to support the weight of the creature is a slight depression on the surface round each foot, so small and shallow as to be scarcely visible.

OUR MAIL BAG

In this column the Editor replies to letters from his readers, from whom he is always pleased to hear. He receives hundreds of letters each day, but only those that deal with matters of general interest can be dealt with here.

Correspondents will help the Editor if they will write neatly in ink and on one side of the paper only.

N. C. King (Peterborough).—We regret that we cannot undertake the valuation of second-hand bicycles. Why sell your machine at all? Unless you intend to purchase another we feel sure that you will be very sorry when it is gone.

Hermann Jacobsen (Johannesburg).—We note that since Mr. Cobham's flight all the children are suffering from Aeroplanitis! It sounds pretty serious, but we are not surprised, for there was quite an epidemic here, too. We are glad to know that the three dogs are as mischievous as ever. We have two terriers and they are a handful at times. But you may tell Billy, Prince, and Lady that a dog that is polite and well-behaved is only half a dog, in our opinion!

—?— (Coldwater, Ontario).—You wrote a very interesting letter to us, but omitted to sign your name. The only address given is Coldwater, Ontario, so we have been unable to reply. Please write again and let us know your name and full address this time.

J. Fletcher (Dunedin, N.Z.)—Your letter, written on the special notepaper issued by New Zealand and South Seas International Exhibition, was very welcome, and you evidently had a very enjoyable time. We are interested to hear of the Railway exhibit, which contained the largest sleeping car yet built in the Dominion.

H. F. Cook (Atwell, Nr. Derby).—We will see what we can do about describing some tours around Birmingham. The mileage you cover in a day depends, of course, entirely upon your physical strength and energy, and the time at your disposal. To Lichfield and back should be a very nice run and we hope you will write and tell us how you enjoyed it.

E. Griffiths (Grahamstown, S.A.)—We are not in the least bored by your letters, E.G., and you must write oftener. Acrostics are very interesting we agree, but there are so many interesting subjects for the "*M.M.*" that some have to be missed from sheer lack of space.

"Noel's Mother" (Wrexham).—Your kind remarks are much appreciated and we were very much amused by the tactful family friend's remark! We hope that Noel is to be one of our permanent friends and no doubt before long we shall be having letters from Jack, whom we hope is progressing well.

A. Mac Pherson (Roseville, N.S.W.)—Of course you may enter the various competitions, Allen! There are special sections for overseas boys, and we look forward to receiving your entries. Your drawings are very good.

R. Plumb (Ruislip).—"I look forward to the time when the "*M.M.*" has about 500 pages and is published every week!" Pity the poor Editor! Your artless remark nearly caused a strike, R.P., and we are afraid that if you continue to look for this your sight will fail before your dream is realised!

Gerado Pena (Tucuman).—Your model of an Electric Crane won a silver medal in our Model-Building Competition of 1925. The medal was duly sent to you, but has now been returned by the postal authorities. If you will write us, giving your new address, we will again forward the medal to you.

J. Phillips (Glasgow).—We have not sufficient space here to give you general advice on choosing a machine. You will find the subject was fully dealt with in the "*M.M.*" for December, 1924.

A. C. Thompson (Ramsgate).—We much appreciate your tribute to the high standard reached by the "*M.M.*," and we are glad to know that "all the family enjoy reading it." It gave us pleasure to reward your boy for his good work in our recent model-building competition.

E. Hayward (Perth, W.A.)—Your statistics, which demonstrate that if we increase the size of the "*M.M.*" in the future in the same proportion as we have done since June 1922 it will consist of 1,152 pages in December 1929, stagger us. It might be done, of course, Eric, but each number would look like a Family Bible and the postman would break down under the strain of delivering them. In any case you couldn't read all those pages every month, could you? And then again think of the poor Editor with twelve times 1,152 pages to fill every year. The answer, Eric, is a positive negative—if there can be such a thing!

J. F. Parke (Salisbury, Rhodesia).—"The fact that you allow overseas readers extra time to send in their entries to your competitions is much appreciated out here." Our overseas readers are very numerous and very dear to us, Julius, and our overseas mail increases every month, much to our satisfaction.

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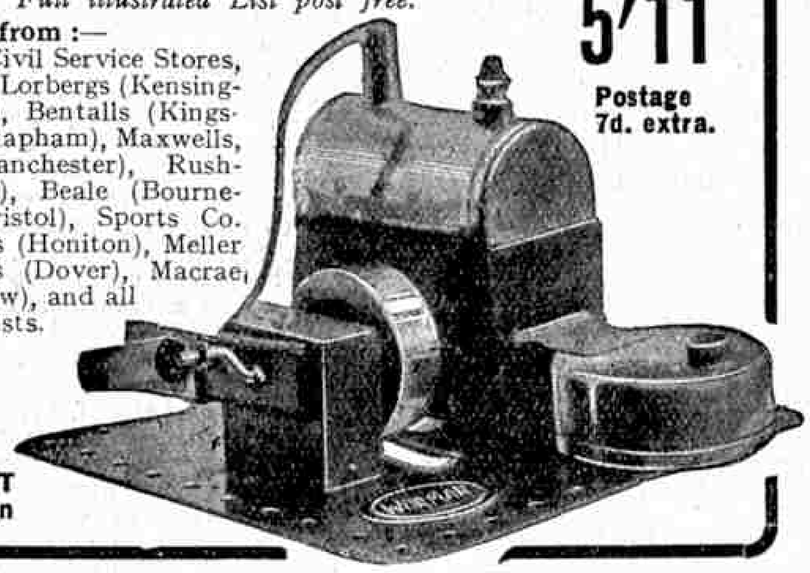

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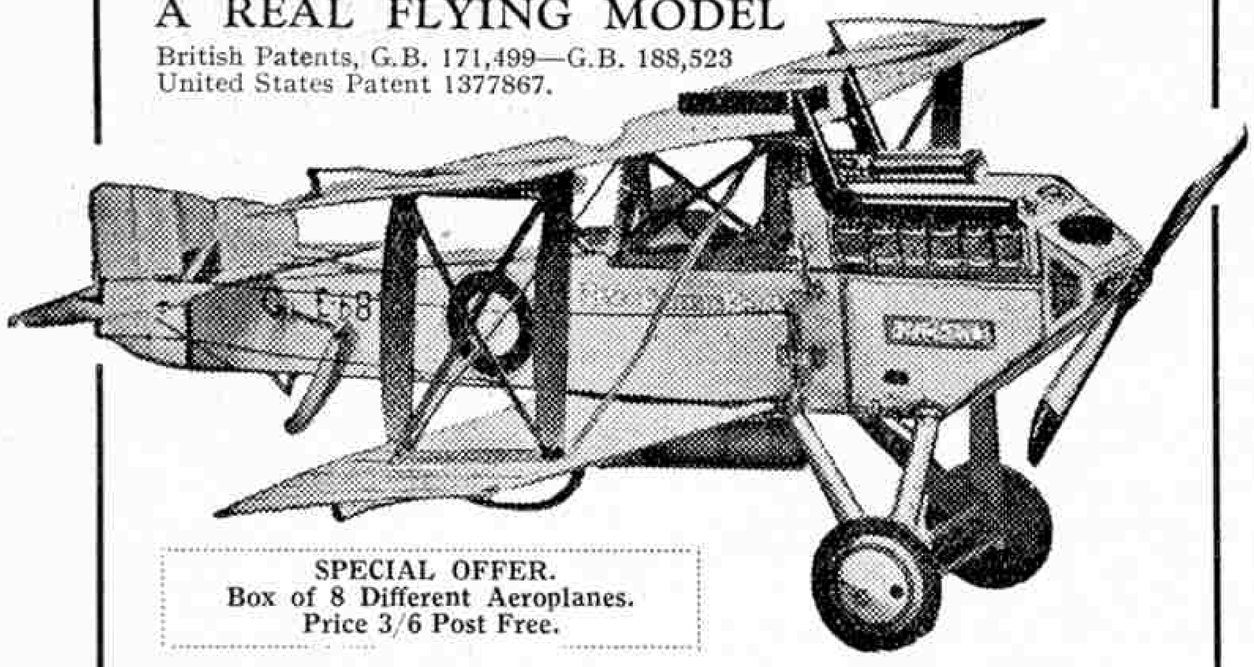

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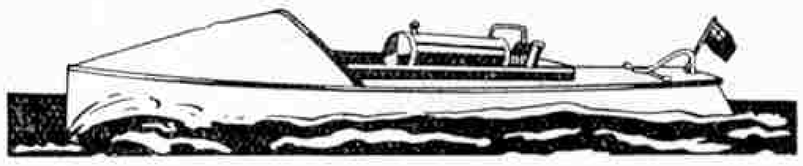

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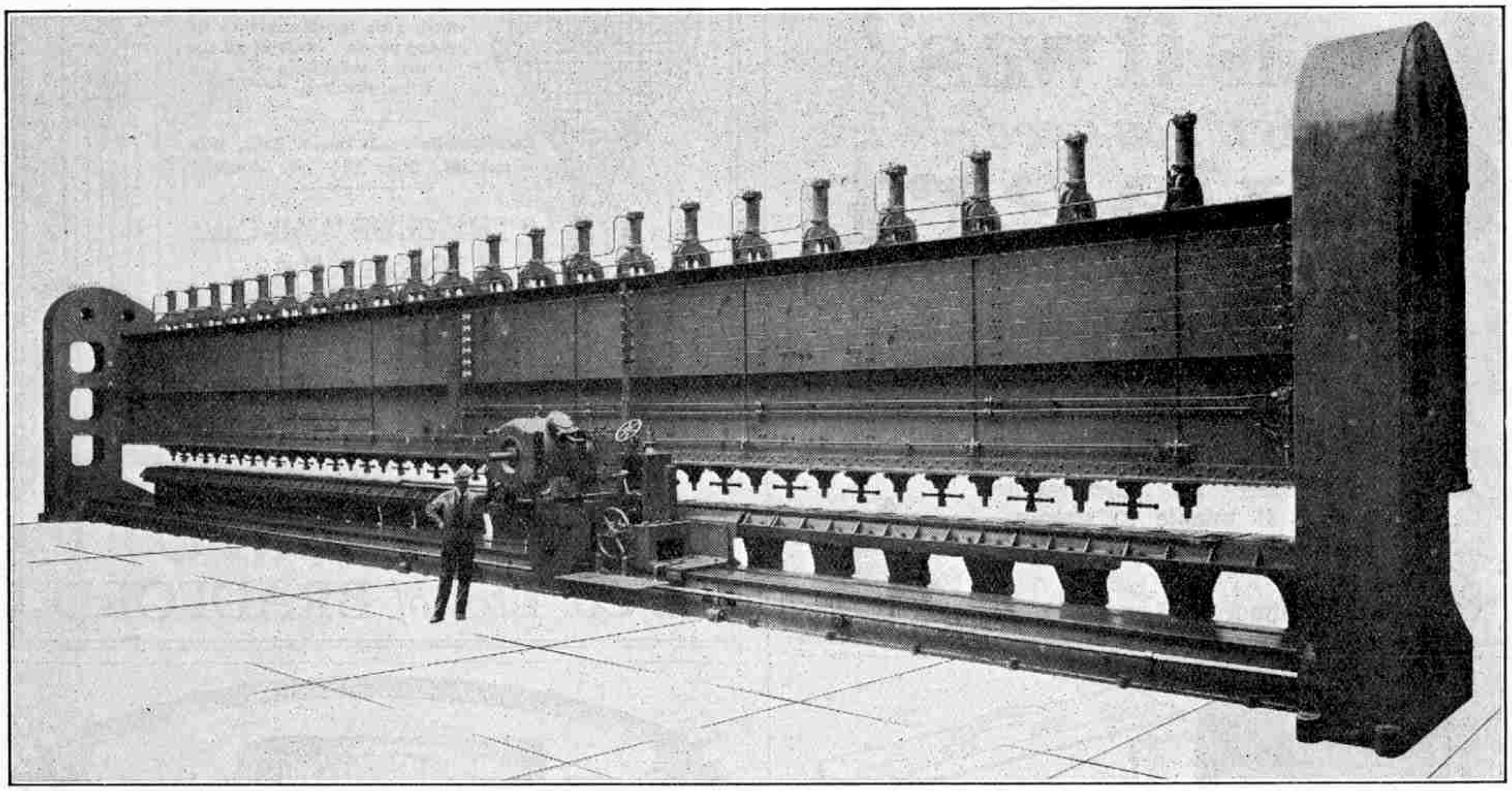
A Giant Planing Machine

For Sydney Harbour Bridge Work



We are able to illustrate an unusually large plate-edge planing machine, which has been built by Messrs. Smith Brothers & Co. Ltd., Glasgow, to the order of Messrs. Dorman, Long & Co. Ltd., for use in connection with the Sydney Harbour Bridge contract.

As our readers know, this bridge is now under construction. It is to be the largest arch bridge in the world, the total length of the arch and approach spans being 3,770 ft. Necessarily, there is a great amount of steel work in it, and the plates, girders, etc., are generally of massive proportions. In order to facilitate the work, special machines, of which this giant planing machine is one, have had to be designed.

The machine is designed to plane the edges of high tensile steel plates up to 66 ft. in length by $2\frac{1}{4}$ in. in thickness. A direct-coupled motor provides the drive and one of the most remarkable features of the machine is the simplicity of the control and the rack drive.

The motor, of 40 brake horse-power at 480 revolutions per minute, is fixed to the saddle that carries the tool, as also is the stop and start switch. Attached to the saddle is a platform from which the operator can start up, stop, and reverse the motor in either direction. Within easy reach are the hand wheels for the vertical and horizontal feeds, and a hand lever for tilting the tool-box, so that the operator has full control of the machine without having to leave the platform. The master-switch is fitted inside one of the large housings at the end of the machine, and is operated through a kicker bar—to be seen at the front of the bed—by a foot lever on the saddle platform.

The tool has two cutting edges, and is carried in a box which is tilted by hand horizontally at each end of the plate, so that the tool is able to cut on the forward as well as on the backward stroke.

Current to the motor is supplied from wires running along the top front side of the girder with which roller collectors make contact. The motor drives through three trains of gear-wheels on to a large pinion. This meshes with a rack fixed to the underside and running practically the full length of the table.

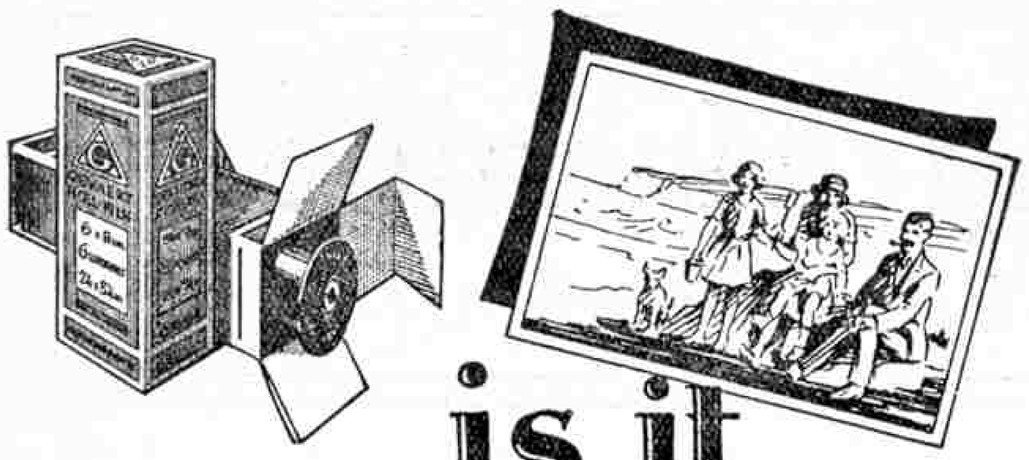
All the gearing, including the rack, are made of steel, the teeth being machine-cut from the solid. Change gearing is provided to give two cutting speeds, namely, 25 ft. and 40 ft. per minute. The machine is arranged in such a manner that, in the event of the trip gear failing to operate properly, or should the current supply fail when the saddle is nearing one of the housings, there is no danger of a smash as a result of overrun. The saddle in these circumstances would simply travel on until it left the rack and came to rest about 2 in. short of the housing.

Each housing is 24 in. in depth and the overall length of the machine is 78 ft. 10 in. The motor traversing the saddle is larger than is necessary, but the size adopted was chosen for the sake of standardisation and interchangeability purposes. In some recent tests, the tool was fed downwards, and cuts $\frac{3}{4}$ in. in depth by $\frac{1}{8}$ in. feed, were easily carried continuously at a cutting speed of 40 ft. per minute.

For holding the plate down on the table, 22 hydraulic cylinders are provided on the top side of the built steel girder. This girder, 7 ft. 2 in. in depth, is jointed in the middle. In addition to the hydraulic cylinders, 21 hand screws are fitted to the under side of the beam alternately with the cylinders, but these screws are only used when water is not available.

It is interesting to learn that for the same contract, Messrs. Smith Bros. & Co. Ltd., recently shipped to Sydney a large single-ended machine with adjustable centres for bending and straightening rolled steel H-beams, measuring up to 24 in. by $7\frac{1}{2}$ in. and 100 lb. in section.

No doubt at a later date we shall hear something more of the performance of these machines and of the important part they are to play in the construction of the world's greatest bridge.



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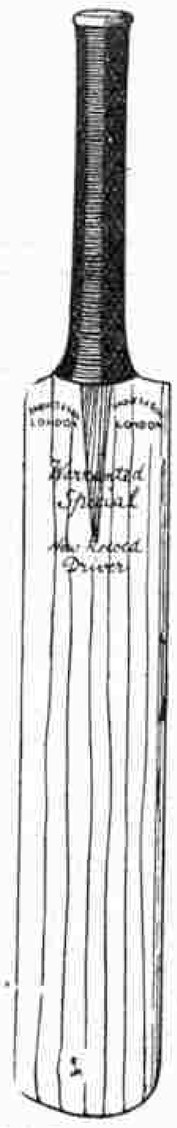

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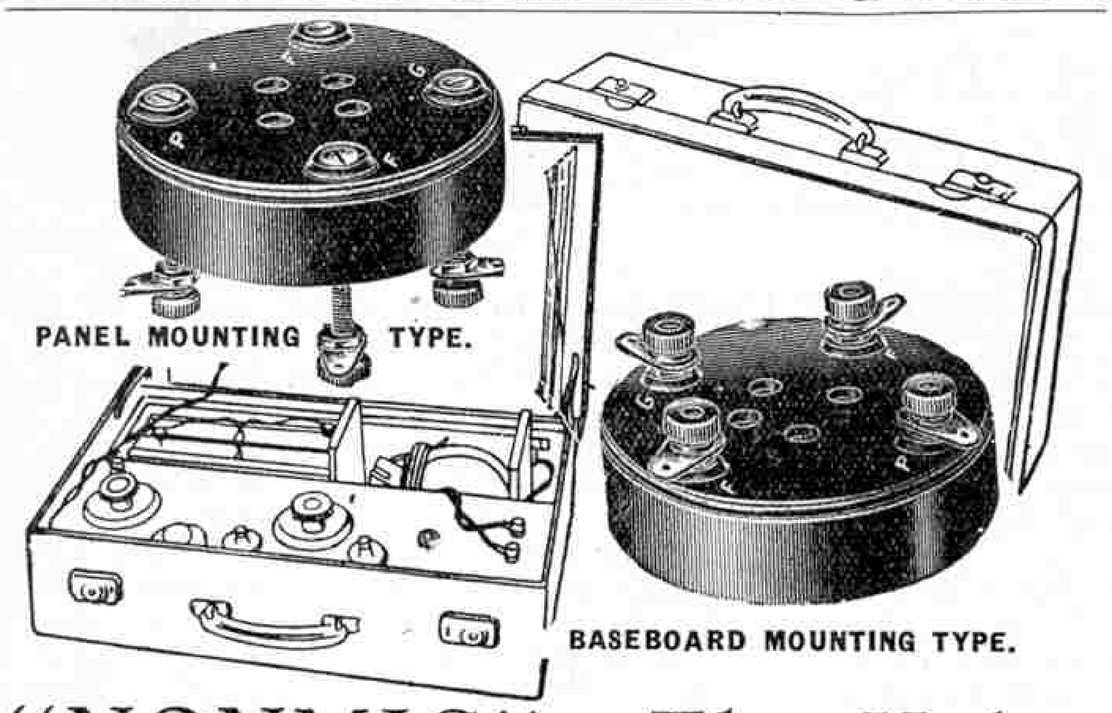

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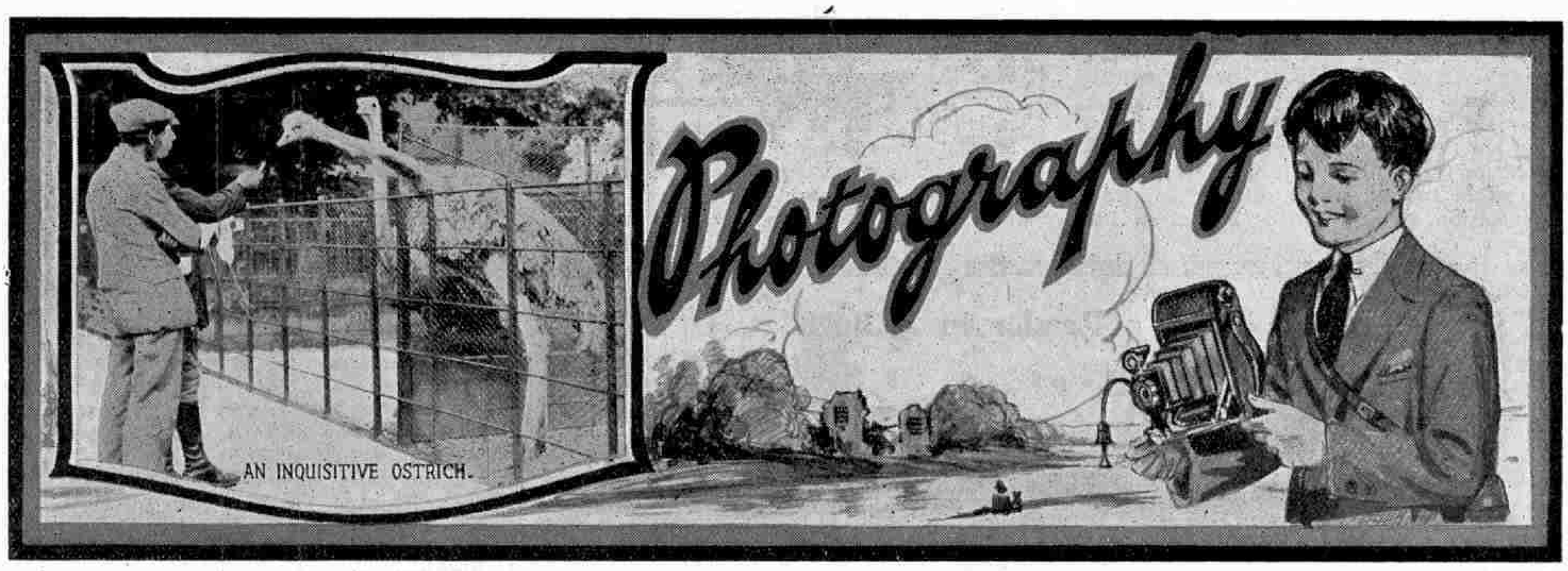

XVI. PHOTOGRAPHING ATHLETIC SPORTS

THE photographer whose taste lies in the direction of action pictures will find an endless variety of opportunity at his school or local sports, and as these gatherings are held between the closing weeks of June and the beginning of September, when the light is all that can be desired, the possession of even a humble box-form camera is a sufficient passport for admission into the ranks of sports photographers.

The secret of the success of sports photographs taken at small athletic meetings lies very largely in the fact that the competitors are known personally to the spectators, who are able to move freely about the course. This personal atmosphere is absent from the larger meetings and, in addition, the presence of large crowds necessarily restricts the opportunities that are available to the photographer.

Photo] [*W. Gabi*

A Fine Sports Photograph

T. C. Carleton (Oxford 'Varsity Ski Team) in a jump turn at Wengen

It is well to consider seriously beforehand just what subjects it is intended to photograph and whether the speed of the equipment is sufficient to command success.

Subjects and Shutter Speeds

For example, if it is desired to obtain a sharp photograph of the finish of the mile cycle race from a distance of 10 to 15 yards, a large aperture lens plus a high speed shutter is essential, for the speed is often nearly 40 m.p.h. at the finish of the race. But a lens aperture of F/11 and a shutter working at 1/30th sec. will secure a reasonably sharp snap, capable of enlargement, at a distance of, say, 40 yards. Therefore, if your shutter is slow, work at a good distance and enlarge your small snaps.

On the other hand, there are dozens of incidents for which the small camera is equally as suitable as the professional's equipment. In many of the events there are moments when the motion of the competitor is practically suspended, and by exercising forethought and acting quickly at the right moment excellent results may be obtained.

In this class we may include the start of a race, at that moment when the runners poise at the mark. Other examples are the change-over of the flag in the relay race and the action of taking the strain in the tug-of-war.

If a special photograph of an athlete is desired, "putting the weight" will afford a splendid opportunity. In this event, movement of the competitor is arrested for a brief period after the "shot" has left his hand and in almost every case a striking and naturally graceful pose is held.

Snapping Jumps

Plenty of opportunities for successful snaps will occur during the high jump and the hurdling. In the former, there is the point during the jumper's clearance of the bar when his upward movement ceases and his drop to the ground commences. It is a bare instant, but sufficient for the purpose.

The view-point chosen must be low, to secure the

effect of height, and the place selected should be on the side of the bar toward which the jumper will fall. But do not waste a plate on the man who rushes to the bar and takes it in his stride. Rather wait for the deliberate jumper who dances up to the bar and uses a slower "scissors" leg action. His speed is less than half that of his rival, and he thus presents a far better subject.

The hurdle race is always a favourite and the best position is at the first hurdle. It is usual to find the runners bunched together here and most of them will be jumping rather more slowly than at the end of the race. If possible the exposure should be made as the first man crosses his hurdle.

The long jump also will provide material for "snaps" but the position to be chosen must be at the end of the space down which the jumper travels. Again a low view-point is desirable.

The Obstacle Race

The obstacle race is decidedly the best event of the day for slow-speed work. The photographer should station himself at the point where the most difficult obstacle occurs. It is there that one finds a bunch of runners in difficulties and opportunities for "close-up" humorous work abound.

It is desirable to decide upon the events that it is intended to record, and make all arrangements beforehand. Having decided that the chosen subjects are within the camera's possibilities; having selected a plate or film of high speed, and having the advantage of good light, only one thing more is essential to secure the desired success—a cool head behind the camera. It is the most important factor in the combination.

Exposing on Moving Objects

Moving objects are very difficult to centre on the plate with the aid of a small view finder, but by choosing the viewpoint beforehand and focussing on a point that the runners must cross, the main difficulties will be overcome. A direct vision viewfinder may be constructed of wire and fitted to any camera at a very low cost and it will be found an invaluable aid when endeavouring to centre a figure on the plate.

The moment of exposure must be judged by watching the runner or jumper and, as he reaches the desired position, the shutter release must be pressed gently and firmly. There must be no hurried snatch at the trigger, for there is the ever-present danger of jerking the camera away from the line of sight, with a consequent displacement of the position of the image on the plate.

From a Reader in India

Photo by [*P. G. Thakar*

A fine view of the Three Ganapati Temples at Wai, on the River Krishna

Those of our readers who have not previously attempted exposures of this nature will find it worth while to experiment beforehand. Ask a friend to run up and down the garden for you, and make one or two trial exposures on him. The result will show whether your judgment was correct and the experience gained will be of great value.

At the conclusion of a sports meeting come opportunities of photographing the presentation of the prizes and, if the light is still fairly good, one or two exposures on this part of the proceedings will provide a suitable crowning of the day's record when the finished prints are mounted in the album.

Photographic Contest—*see page* 459

Outdoor Portraiture

When the average amateur first finds himself in possession of a camera he almost invariably sets to work to make portraits of his relatives and friends. In a few cases these early portraits are sufficiently good to arouse friendly interest in the sitters, but more often the results are very disappointing to the photographer, and occasionally very irritating to the unfortunate subjects! The fact of the matter is that although the taking of a portrait in the back garden appears to be a very simple job, it is in reality a very difficult one.

One of the commonest faults in a snapshot portrait is an unnaturally dark face. This defect is generally the result of posing the face against something lighter than itself—the sky, for instance. In order to get a successful result the photographer should always arrange matters so that his sitter's face comes against something darker than itself.

The choice of a background is generally limited by the resources of the garden and it may be nothing more artistic than a brick wall. Even with an ugly background of this kind artistic results may be obtained by placing the sitter a good distance in front of the background, focussing him sharply, and thus throwing the background out of focus so that it becomes blurred and the ugliness of its details is hidden.

Greatly improved outdoor portraits may be made by diffusing the light, and a sunshade may be used effectively for this purpose. One of the best schemes for outdoor portraiture is to place the sitter in some kind of tent arrangement. With a little ingenuity a very soft light may be made to fall upon the sitter, and also, instead of the light falling evenly on all parts of the face, it may be cut off to some extent on one side, thus making possible a more artistic effect.

Practically any camera and any lens may be used for snapshot portraits. If the camera is of the fixed-focus type, however, close-up portraits can only be obtained by the use of a supplementary lens commonly called a "portrait attachment." This attachment is slipped over the ordinary lens or clamped in front of it by some means, and its effect is to alter the focus of the lens so that a close-up portrait becomes possible. For instance, a vest pocket camera may render sharply objects at about 9 ft. away and beyond, but if we take a portrait with this tiny camera at a distance of 9 ft. the resulting image is too small to be of interest. By using a portrait attachment in front of the lens, the focus of this camera is altered to such an extent that objects at 3½ ft. distance are rendered quite sharply and thus the taking of head and shoulder portraits on a reasonable scale is made possible.

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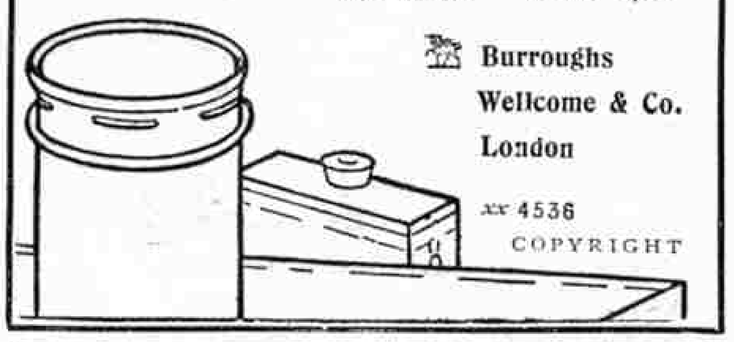

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Competition Page

VOTING CONTEST
The Six Favourite Summer Pastimes

In a recent essay competition readers were asked to state whether they regarded football or cricket as being the better game and to express their reasons for the choice. So great was the entry for this competition that we think readers would like an opportunity of casting their votes in a contest to decide which are "The Favourite Summer Pastimes."

Readers who wish to enter this competition must select six pastimes from the list of ten given below, and write these six down on a postcard in order of preference.

Prizes of Meccano or Hornby Train goods, to be selected by the winner, to the value of £1-1s., 15/–, 10/6 and 5/–, will be awarded respectively to the four competitors whose lists most nearly agree with the final order as decided by the total vote.

Readers may submit more than one entry if they desire, but each must be sent in on a separate postcard addressed "Sports Voting Contest," Meccano Magazine, Binns Road, Liverpool.

Entries must reach this office no later than 31st July, or for Overseas candidates 30th November.

The following is the list from which the six pastimes are to be chosen :—

Motoring ; Cycling ; Golf ; Rowing ; Tennis ; Cricket ; Fishing ; Photography ; Swimming ; Walking.

County Cricket or League Cricket?

Opinions are divided as to the relative merits, from the spectator's point of view, of County cricket and League cricket. The most noticeable difference between the two lies, of course, in the time devoted to the matches—three days in one case and an afternoon in the other.

Many cricket enthusiasts complain that County cricket is slow, unenterprising, and uninteresting ; and that in comparison League cricket is swift and exciting. On the other hand, others insist that the play in a County match is on a higher plane as regards skill than that in a League match, and that those who complain of the slowness of the County game are deficient in the real cricket instinct.

It is contended further by the supporters of the County game that the League element introduces an atmosphere of unnecessarily keen competition, sometimes to the extent of causing players to forget the essence of the game in the attempt to gain the coveted points. On the other hand, League supporters point out, quite fairly, that the very keenness of their game is the secret of their love for it. The batsmen are compelled to attack the bowling in the attempt to build big scores in the limited time available.

We are curious to know what our readers think about this matter and therefore we announce this month an essay contest on "County Cricket or League Cricket, Which Provides the Better Game ?"

Essays must be limited to 500 words, and must be written on one side of the paper only. Each sheet of paper used must have written upon it clearly the competitor's name and address, and in addition on the first page his age.

There will be two sections, A for those of 16 and over and B for those under 16. Cash prizes to the value of £1 1s. 0d. and 10/6 respectively will be awarded to the competitors whose essays are adjudged first and second in each section.

Closing date 31st July. Overseas, 30th November.

16th Drawing Contest

Almost any feature connected with the sea is of interest, but there is a special fascination about the lighthouses and lightships that guide our shipping night and day and in all weathers. The most romantic lighthouses are, of course, those such as the "Longships," the "Wolf" or the "Bishop," which are situated upon cruel ridges of rock out at sea and swept from base to lantern during the storms of winter. Another lighthouse that will readily occur to our readers is that upon the Eddystone rock, to which we referred in our account of the life of Smeaton. There is a great deal of interest, however, even about such lighthouses as that at Flamborough, perched high up on the cliffs of the mainland. Lightships too, vary in many respects, but all are worthy of our attention.

As the subject of our 16th Drawing Contest we have chosen "A Lighthouse or Lightship." Competitors may submit more than one entry if they so desire, but in every case it is important that the name, address and age of the competitor shall appear on the back of each drawing.

The contest will be divided into section A for those of 16 and over and section B for those under 16. Prizes of drawing or painting materials (or Meccano Products), to be chosen by the winners, to the value of £1 1s. 0d. and 10/6 respectively will be awarded to the best and second-best entries in each section.

Closing date 31st July. Overseas, 30th November.

Results

4th Sharp Eyes Contest

It was amply demonstrated by the heap of entries that there is no falling off in the volume of enthusiasm for Sharp Eyes Contests. The keenness shown in this particular competition was really remarkable and it must be attributed to the enthusiasm for cricket and a thorough knowledge of the game.

This drawing provoked a deluge of correspondence. One enthusiast wrote to say that he really felt that our picture was "the greatest atrocity perpetrated since the war !" He added that it would have been easier to compile a list of points on which our artist was correct than to enumerate his errors. We hope to have something to say to this critic next month ! Other competitors took the opposite point of view and added footnotes to their entries stating that it was the most enjoyable contest of the set and that the picture was worth preserving as an illustration of a comic cricket match. After all, it *was* an Errors Competition !

The fact that the Overseas Section still remains open makes it impossible to give a detailed review of the results and we therefore give only the list of awards.

First Prize, DENNIS ELSON (Swanvale, Nr. Falmouth) ; Second, BURTON CARNSON (London, S.E.13) ; Third, ERIC HOLDEN (Barnsley) ; Fourth, PHILIP BURTON (Cheltenham).

May Essay

In this contest readers were required to write on the subject of their "Favourite Model," and the entry was unusually large. The models selected ra ed over a very wide selection, but the Chassis an he 4–6–2 Tank Loco were easily the most po ar. On the other hand, many boys showed a decided p er-ence for models that could be used definitely as rt of the equipment of a Hornby railway.

The awards were as follows :—

First Prize—Section A, G. H. GRAVES (Bootle) ; Section B, C. STAIRMAND (Darlington). Second Prize—Section A, R. S. EVANS (Manchester) ; Section B, P. C. Peppiette (Birmingham).

Overseas Results

Limericks Contest

As was the case in the Home Section, many competitors endeavoured to introduce the word Meccano into their efforts, and while several attempts were highly creditable the choice of a suitable rhyme was the main difficulty. A specially interesting feature was the complete absence of "old favourites." Hardly one Limerick submitted could be termed prehistoric. Apparently an astoundingly large number of old men and old ladies met with alarming accidents in various parts of the world during this competition, in desperate attempts to provide rhymes for our competitors !

The awards were as follows :—First Prize, RALPH GARCIA (Trinidad, B.W.I.) ; Second, JOHN HARDING (Nova Scotia, Canada) ; Third, FRANK DAWSON (Auckland, N.Z.) ; Fourth, H. A. FRAZER (Wellington, N.Z.)

12th Drawing Contest

The Guild Secretary was a good deal depressed by some of the entries in the Home Section of this contest, but his feathers were really ruffled by some of those in the Overseas Section ! After looking through about half a dozen of the most uncomplimentary, specially selected for his benefit, he sighed an extra large sigh and shook his head sadly. Since then various members of the staff have caught him surreptitiously inspecting himself in a small cracked piece of looking-glass that he hides in a drawer ! However, the G.S. commences his vacation next week and there are hopes of his recovery !

First Prizes : Section A, E. HOLDEN (Trinidad, B.W.I.) ; Section B, NORMAN JOLLY (Malta). Second Prizes : Section A, J. DE CONTE MANDUCA (Malta); Section B, ROWAN E. PRINS (Cape Province).

The Secretary's Notes

The Meccano Guild has progressed steadily from its inception and I have become so accustomed to its growing membership that I have almost come to take it for granted that each post will bring in a sheaf of application forms. During the last twelve months, however, the increase in membership has been a source of genuine astonishment to me and all at headquarters. All past records have been broken and the rate of enrolment still continues to rise.

Guild's Great Year

This great increase must be attributed very largely to magnificent recruiting work, both by individuals and by clubs. At one time some of the Meccano Clubs were so absorbed in their own domestic affairs that they neglected to do their share towards building up the Guild, but to-day the case is very different, and concerted recruiting work by clubs is producing some very remarkable results. One of the most striking instances of club recruiting is provided by the Exeter M.C., which has been the means of bringing into the Guild during the past 14 months no less than 200 members! It is impossible for all clubs to achieve results of this kind, but it is very encouraging to notice month by month that clubs throughout the world, almost without exception, are striving and striving successfully to bring new members into the Guild. The increase in membership naturally adds very greatly to the strength of the Guild, but of even greater importance is the fact that this increase shows that the Guild spirit is not only alive but steadily becoming a more active influence.

Splendid Recruiting

I have been asked repeatedly to provide space on the Club Membership Card for entering the weekly subscriptions of members. After careful thought I have come to the conclusion that to do this would involve making the card too large to be convenient. I have decided, therefore, to provide a separate subscription card and this is now in preparation. The card will measure approximately 5½ in. by 3¼ in., and will provide for the entry of the name of the club, the number, name and address of the member, and for twelve weekly subscriptions, with spaces showing the date and the amount and the initials of the person receiving the money. These cards will be available in the course of a few days. They will be supplied free of charge to all affiliated clubs, and secretaries should let me know their requirements immediately.

Subscription Cards for Clubs

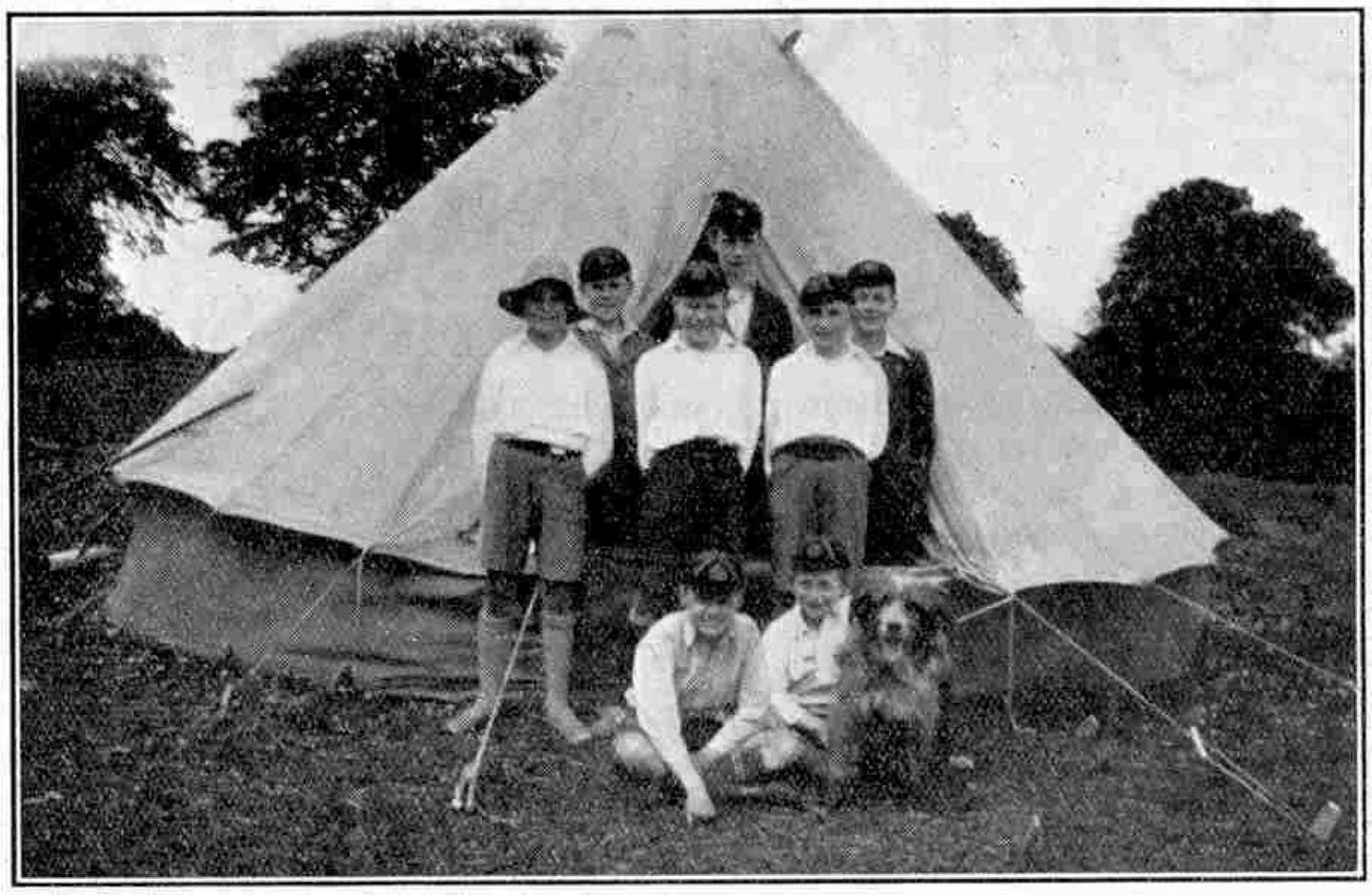
Among the most interesting of the letters I receive are those from club Leaders. I value these letters especially on account of the suggestions they contain for the improvement of the Guild in general and for new ideas to increase the scope and attractiveness of club programmes. During the past few months several Leaders have suggested the inauguration of some kind of inter-club competition, with the object of inducing a spirit of friendly rivalry and at the same time bringing about an increased mutual interest among clubs. A scheme of this nature was tried some time ago and proved successful up to a certain point. The circumstances were not favourable at that time, however, and the scheme was abandoned. The number of clubs then existing was very much smaller than it is to-day, and the Guild had not reached anything like its present strength and vigour. I am strongly in favour of inter-club contests and I am confident that a carefully-planned scheme would meet with enthusiastic support during the coming winter. The first question to be decided is that of the form such contests should take, and I want to ask all Leaders to discuss this matter with their members during the next month or two and let me know the general opinion. The most obvious scheme of course is that of a series of model-building contests, but there are many alternatives, possibly more attractive, and I am anxious to know the views of the clubs as a whole. I hope that Leaders will give this subject their serious consideration.

Suggestions from Leaders

Another interesting suggestion put forward is that for a Club Conference to be held annually. The idea is for a meeting to be arranged at which would be present Leaders, secretaries and other club officials, together with a certain number of members of each club, these last to be chosen by ballot among their fellow members. The value of a conference of this kind would be very great, and although its arrangement presents many serious difficulties, the idea is by no means impracticable. On this matter also I should like Leaders to consult their members and let me know their views.

A Club Conference

A Happy Camping Group



Our photograph shows a happy group of members of the Weston Meccano Club, taken on the occasion of their Whitsun holiday, when they camped out in the Mendip Hills. This club was affiliated only a few months ago, but has made excellent progress under the Leadership of Mr. H. G. Peckham, who unfortunately is not included in the group. On the right is Mr. Peckham's dog "Farmer," the club mascot.

Sad News from Rosyth

The unfortunate ending of the very promising club at Rosyth was referred to in Club Notes some time ago. The Royal Dockyard closed down, thus making it necessary for very many families to leave Rosyth for other towns. As a result the happy band of Meccano enthusiasts who had been holding meetings under the Leadership of Mr. G. Cook, became dispersed.

Mr. Cook now informs me of the sad news of the death of the Rosyth Club Secretary, Master Teddy Hunter. Teddy's sunny disposition and keen enthusiasm for his club made him a general favourite and his death is deeply regretted. At the funeral Mr. Cook and a few of the members represented the Meccano Club, which was perhaps Teddy's greatest interest in life. I am sure that all members of the Guild will join with me in expressing sympathy with Teddy's family in this sad loss.

CLUB NOTES

Weston M.C.—Went to camp in the heart of the Mendip Hills for the Whitsun holiday and had a splendid time. The weather was favourable and all arrangements were well carried out, the Leader so far forgetting care and worry as to burn the custard when preparing tea! A popular member of this club is a fine dog, "Farmer," who greatly enjoys a romp and is a splendid swimmer and diver. A visit to the Cardiff Broadcasting Station proved extremely interesting. Club roll: 14. *Secretary*: Ralph B. Nichols, 3a, Royal Parade, Weston-Super-Mare.

Pershore M.C.—Is developing along promising lines. A large dance room at the home of the secretary provides an excellent club room and regular meetings are well attended. Captain L. Elkington is the Leader. Club roll: 15. *Secretary*: Tom Pettifer, High Street, Pershore.

St. Albans M.C.—Recently affiliated under the Leadership of Miss Constance Brookes, this club holds two meetings each week, and activities include Model-building, Cricket and Football, and Cycle Runs to places of interest. Club roll: 9. *Secretary*: Arthur H. Dunkley, 25, Albert Street, St. Albans.

Richmond (Surrey) M.C.—Is progressing excellently, Cricket and Sports being greatly enjoyed. A club Magazine, "The Meccano Herald," has been introduced and is sold at 1½d. per copy. A recent Cycling Excursion included a visit to Claygate M.C. Fretwork is to be included in the syllabus, and a Girls' Section, recently established under the Leadership of Miss Viney, promises to be very successful. Club roll: 36. *Secretary:* A. R. White, 15, Albert Road, Richmond.

Collegiate Schools (London) M.C.—Recent activities include two Lantern Lectures and a visit to the Waterworks. An Exhibition is being prepared, which will comprise a large Hornby Train layout, with stations, points, sidings, etc., a good selection of Models, a Rifle Range, Aunt Sally, display of "lightning sketches," and a Phrenologist. The membership is increasing. Club roll: 36. *Secretary*: W. Wright, 8, Derwent Road, Palmers Green, London, N.21.

Middlesbrough M.C.—A highly successful Exhibition was attended by over 250 people, including the members of Stockton M.C., who showed a fraternal interest by visiting the function en masse. The models displayed included a Marine Engine, three types of Tank Loco, Eiffel Tower, Meccanograph, and many others. Transporter Bridge and Workshop models were loaned from Headquarters. The local dealer, Mr. Scupham, loaned a fine Hornby Electric Train layout. Press notices of the Exhibition were particularly favourable, and a Recruiting Campaign resulted in a good increase of membership. A club Library is being formed and the Savings' Bank account is growing. A Club Concert Party is in process of formation, and an Assistant Secretary has been appointed in W. Tash. Club roll: 43. *Secretary*: A. Bradley, 23, Laurel Street, Middlesbrough.

Harwich M.C.—Has closed down for a few months, new plans being made for a grand re-opening in September. A special "Breaking-up" evening was held recently, preceded by a very amusing Mock Trial in which Mr. Whittingham acted as Judge and caused much hilarity by his rendering of the role. Mr. Whittingham gave a farewell address at the "sing-song" that followed, as on account of joining the Church Army his connection with the club will unfortunately be terminated. A presentation is being made to him as a token of esteem. Mr. Ernest Pratchett has been appointed sub-Leader in his place. Club roll: 101. *Secretary*: Alfred E. W. Ward, Osborne House, Pepys Street, Harwich.

Blagdon St. Andrew's (Bristol) M.C.—Good progress is reported, Lectures being a notable feature. The Girls' Section devotes a good deal of time to the making of artificial flowers, and Mrs. Prior, a patron of the club, is teaching the members a new kind of Fancywork. It is intended to introduce Wild Flower Collecting, for which excursions to the country will be made. A visit to Fry's Chocolate Factory is contemplated in the near future for both sections. Club roll: 33. *Secretary*: Miss K. R. Day, Seymour Arms Hotel, Blagdon, Nr. Bristol.

Holy Trinity (Barnsbury) M.C.—A very successful concert was held recently to raise funds for new club-room equipment. A sale of work held by Holy Trinity Church included a special Meccano Stall, provided by the club. The Leader has been reading aloud chapters from a very interesting book, "Arthur Mee's letters to a Boy," including "To the Boy who is Leaving School." The introduction of a club **Magazine is under consideration. Club roll: 31.** R. Clark, 77, Richmond Road, Barnsbury, London, N.1.

Bures M.C.—Outdoor Sports and Cricket have been arranged, but inclement weather has largely impeded progress in this direction. Two meetings are held each week, Games such as draughts, and card tricks by Mr. Bunker, the Leader, are very popular. Club roll: 17. *Secretary*: J. Dessent, Queen's Head, Bures.

St. Saviour's (Tonbridge) M.C.—Is making steady progress, and a splendid spirit of unity exists among the members. A Meccano Sports Day is being planned, neighbouring clubs in Kent being invited to participate. Club roll: 17. *Secretary*: Cyril F. Copper, 91, Shipbourne Road, Tonbridge, Kent.

Withington (Manchester) M.C.—Recent activities include Cricket matches and Rambles, while Rounders and other outdoor games are greatly enjoyed in a field conveniently near to the club-room. Meetings are held out of doors while the weather is good, with the exception of special business meetings. Club roll: 8. *Secretary*: Kenneth Cradduck, 36, Mauldeth Road West, Withington, Manchester.

Meccano Club Leaders

No. 27. Mr. Peter Thomson

Mr. Peter Thomson is the Leader of Castle Douglas Meccano Club, Scotland. This club was formed early in November 1925, and made such rapid progress that affiliation was granted at the end of the same month.

The club has been fortunate in obtaining very valuable assistance and support. The President, Mr. Whiteley, has placed a large room at the disposal of the club for meetings, and his daughter, Mrs. Murray, acts as treasurer, and takes a very keen interest in all activities.

Members are enthusiastic about everything pertaining to Meccano and in addition they have a speciality of their own. This is dart rifle shooting, in which Mr. Thomson acts as instructor, and next to model-building it is the most popular feature of the syllabus.

Teignmouth M.C.—A Concert recently held proved very successful and the proceeds enabled a Cricket Outfit and a Hornby Train Set to be purchased. Each boy is to contribute a piece of rolling stock to the Train Set, which will be the property of the club. The Meccano lecture "Lives of Inventors" was read and proved very successful. Club roll: 20. *Secretary*: D. Ford, 16, High Brook Street, Teignmouth, Devon.

Stockton-on-Tees M.C.—Contractors' Nights are being held regularly and a prize will be awarded at the end of the year for the best work. A Wireless Aerial has been presented by a patron of the club, which now has its own Wireless Installation. An interesting lecture on Wireless was given recently by Mr. W. F. Wood, F.W.A.G.B. To commemorate the first anniversary of the club, members arranged an outing which included a visit to the Exhibition of Middlesbrough M.C. Club roll: 18. *Secretary*: N. Middleton, 14, Victoria Avenue, Stockton.

South Park Meccano and Hobbies Club.—Chief activities comprise Model-building, Lectures and Debates, the latter including one on "Electricity versus Gas," in which the verdict went to the supporters of gas. A request has been made by the local Council for the club to organise a "Hobbies" exhibit in connection with an Educational Exhibition to be held at the Town Hall. Club roll: 35. *Secretary*: S. R. Steele, 20, Ripley Road, Seven Kings, Ilford, Essex.

Garstang and District M.C.—Is revived under the Leadership of Mr. Cartmell, after a temporary cessation of activities. Recent club evenings have been devoted to Model-building, Boxing and Games. Club roll: 22. *Secretary*: John Gardner, Moss Lane, Garstang

St. Lawrence (Jersey) M.C.—This newly-affiliated club is busy with Model-building, Hornby Train Evenings, and Lectures on Aeroplanes, Wireless, Stamp Collecting, Geology and similar subjects. Cycle Races and Paper Chases are being arranged. The club is fortunate in having for its Leader and President Mr. F. H. Whistler, Headmaster of the St. Lawrence Central School. Club roll: 10. *Secretary*: Jack Langlois, Ville au Veslet, St. Lawrence, Jersey.

Heswall M.C.—Is affiliated under the Leadership of Mr. A. P. Ludeck. Meetings are held weekly in Winter and fortnightly in Summer. A Play is being rehearsed the proceeds from which are to be devoted to an extension fund for the Sunday School of the Church that is very kindly providing a club room. Picnics are to be arranged during the summer and a Cricket Team is being organised. Club roll: 12.. *Secretary*: Geoffrey Birch, The Cot, Tower Road, South Heswall.

Clubs not yet Affiliated

Greenfield M.C.—This club is now well established, and although an adult Leader has not yet been obtained, a successful Model Exhibition has been organised and an attractive Summer syllabus drawn up, comprising games and sports of all descriptions. A club Magazine is to be introduced later in the year. New members are cordially invited to communicate with the *Secretary*: Ronald Moss, 4, Carr Lane, Greenfield, nr. Oldham, Lancs.

Galway (Ireland) M.C.—A small club has been established and new members will receive a hearty welcome. *Secretary*: William Glennon, 2, St. Patrick's Road, Galway, Ireland.

Newport M.C.—Some very good models have been constructed and the club has a fine Hornby Train Set. During the summer months meetings are held once a fortnight as the members are keen cricketers and devote a good deal of the time to the game. A committee of three has been appointed, and Mr. Linton, the Leader, intends to apply for affiliation very soon. *Secretary*: Sydney John, 40, Blewitt Street, Newport, Mon.

Cranham M.C.—A club has been formed and Mr. J. C. Cheshire has very kindly accepted the Leadership. It is hoped that suitable accommodation may be obtained in the Local Church Hall next winter. Club roll: 8. *Secretary*: John Cheshire, Post Office, Cranham, Romford.

Mossley M.C.—A club-room has been obtained and the lack of a Leader is now the only impediment to further progress. Jack Yates, to whose efforts the early progress of the club is largely attributable, has been obliged to give up the secretaryship. New *Secretary*: John Ashton, 4, Stamford Road, Mossley, Manchester.

Remuera (Auckland, N.Z.) M.C.—Several meetings have been held by this promising club, which is well supported. Efforts are being made to secure an adult Leader in order to effect affiliation with the Guild. Club roll: 52. *Secretary*: Howard B. Patterson, 45, Arney Road, Remuera, Auckland, N.Z.

Proposed Clubs

Bloemfontein (South Africa) M.C.—Nelson Tuck of 11, Short Street, Bloemfontein, South Africa, is endeavouring with the aid of friends to form a club, and inquiries from local Meccano boys will be welcome.

Hessle M.C.—Possesses a Leader, treasurer, reporter and secretary, and the main difficulty now lies in the absence of a suitable club-room. New members will be welcomed. Club roll: 7. *Secretary*: T. A. Fillingham, "Red Lea," Marlboro' Avenue, Hessle.

Bradford M.C.—All boys who wish to support a scheme to establish a Meccano Club in Bradford should write at once to S. Rhodes, 122, Westgate, Bradford.

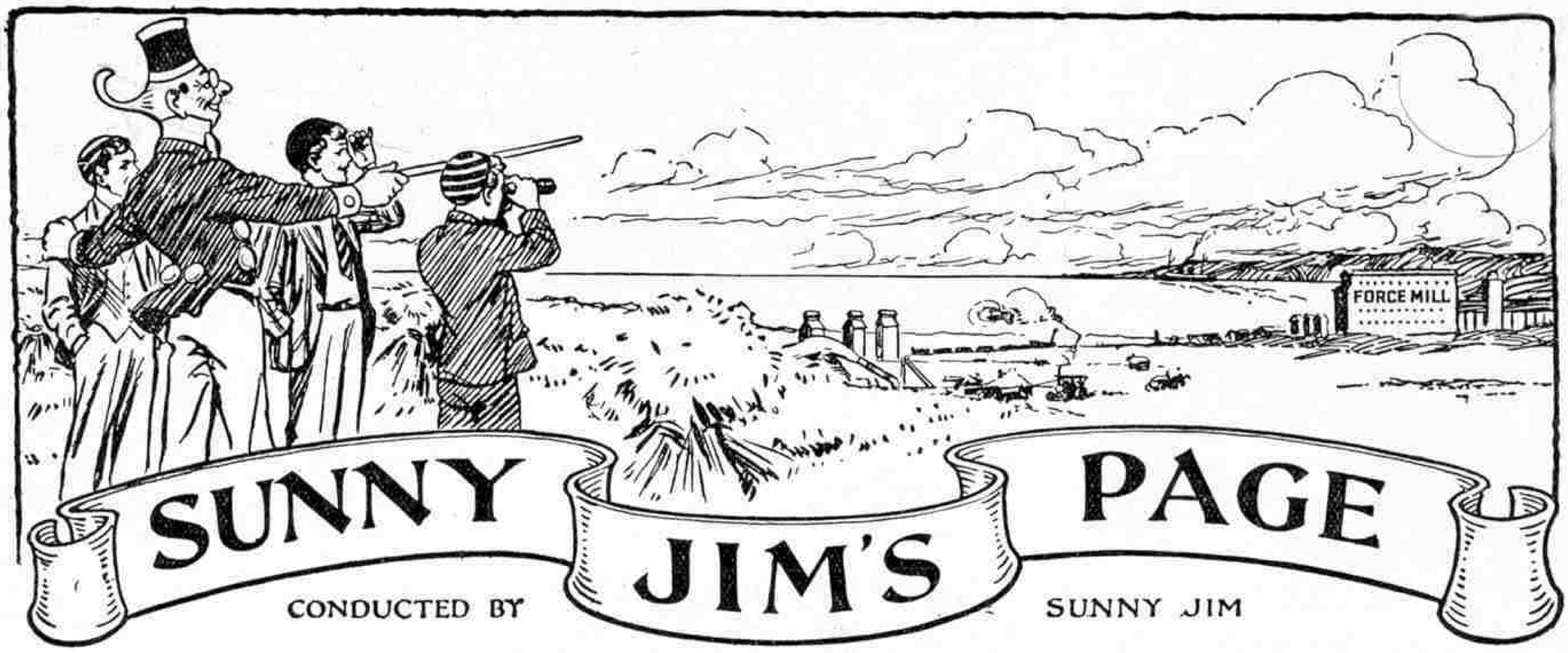
Uttoxeter M.C.—A club is in process of formation and members are grappling with the usual problems of a Leader and a club-room. Recruits will be welcomed by the *Secretary*: E. H. Davies, 49, New Street, Uttoxeter, Stafford.

Lauder (Berwickshire) M.C.—A club is being formed by Mr. E. O. Brough, Watchmaker and Jeweller, Lauder, Berwickshire, to whom all interested should write.

Dublin M.C.—Boys living in Dublin will be interested to learn of a club that is being formed in the North Wall district. The secretary, Myles Byrne, has been endeavouring for many months to bring about the formation of a club and has persevered in spite of constant set-backs and difficulties. He has now won the interest and assistance of Mr. E. Blackburn, of the Dublin Society of Model and Experimental Engineers, and it seems likely that a progressive club will soon be holding regular meetings. *Secretary*: Myles Byrne, 14, Newfoundland Street, North Wall, Dublin.

Coatsworth (Ont., Canada) M.C.—A club is being formed by a small band of enthusiasts at Coatsworth, Ontario, Canada. It is intended to make this a "Meccano Scouts'" movement, and boys interested should write to Albert B. Hill, Rural Route, No. 1, Coatsworth, Ontario, Canada.

Sunderland M.C.—Efforts are being made to form a club and all those who are interested should write to Joseph C. Ray, 19, Westbourne Road, Sunderland, Durham.



197, GREAT PORTLAND STREET, LONDON, W. 1.

NOW LET'S MAKE A CANADIAN GRAIN ELEVATOR

Look at the fine new picture I have had drawn for the heading for this page. There I am, telling three Meccano Boys the wonderful story of how "FORCE" is made.

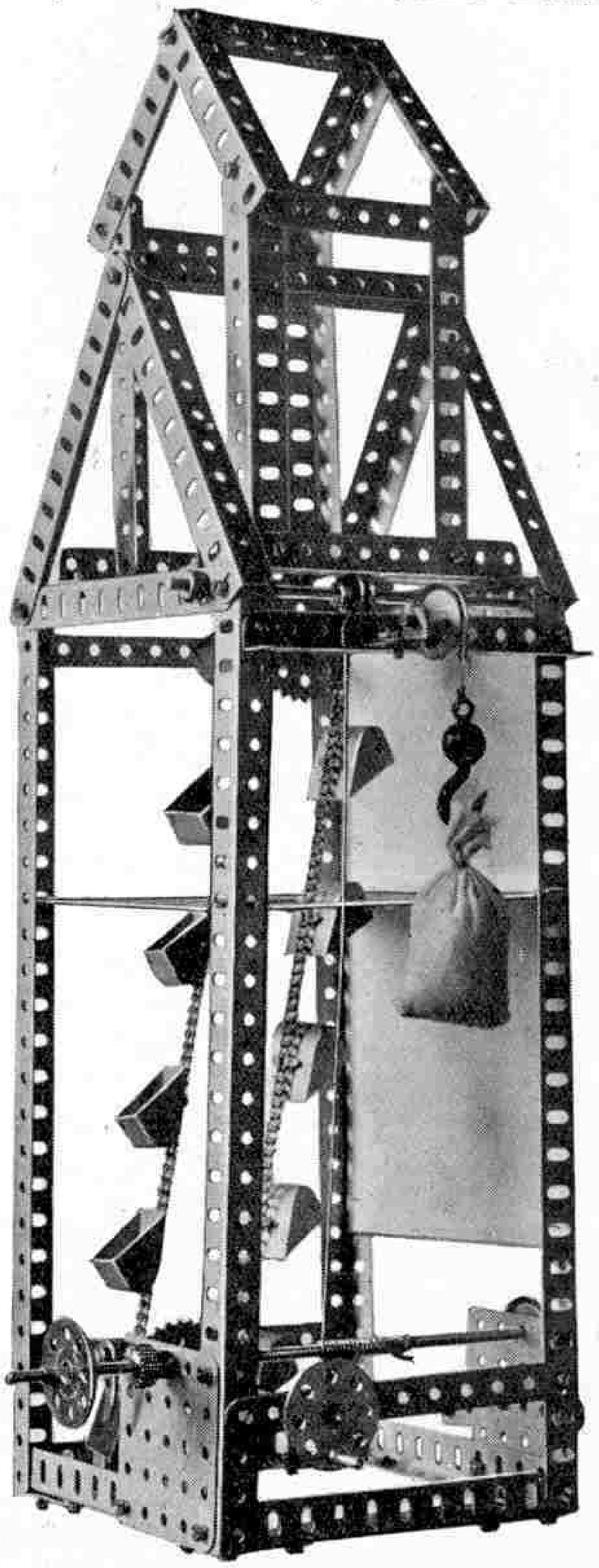
If you consider this picture you will see that nearly everything in it has been described to you on this page at some time or other. In the issue of September 1925 were full instructions showing how to make a model of the "FORCE" Mills. In the issue appearing in May 1925 were full instructions showing how to make your own panoramic model of the harvesting scenes, and in the number of the "Meccano Magazine" published in March 1925 was the full story of the journey of wheat from Canada's wheatlands to the "FORCE" Mills.

In this number of the "Meccano Magazine" I therefore propose to tell you how to make your own little model of one of the grain elevators to which the wheat is taken and stored before it is loaded on to the train.

In a real grain elevator the wheat is carried to the top either by a corkscrew conveyor, or a small dredger-like appliance, until the whole of the elevator is full of wheat. When the train draws up alongside, the wheat is shot into the trucks, and, as each truck fills, the train moves along so that the succeeding truck is brought beneath the elevator pipe. Since it is impossible to fill a Meccano model with wheat in this way, we must modify the principle a little, but we can get a very fair representation of it as follows:—

Using the parts shown in the photograph build yourself a grain elevator.* It will be proportionate in size to an ordinary No. "0" gauge model railway. Of course if you have a model railway, or if you have a friend who has one, you will now be able to invent quite a realistic game which will bring into play your working model of the elevator. A little model horse wagon will add the final realistic touch. Loaded with loose wheat your wagon comes from the scene of the threshing into the elevator yard. It draws up at the base of the elevator, and the wheat is transferred into the buckets of the conveyor. When the handle is turned away goes the wheat to the top of the elevator. As wagon after wagon comes in from the harvest field, each bringing its load of golden grain, ceaselessly the elevator buckets pile up the wheat ready for the arrival of the Canadian Pacific freight train

Here is where your model railway will come in useful, for you can now run the train into the siding and stop it underneath the elevator. It is of course not possible to shoot the grain into the train in the actual way it is done in Canada, but you can get quite a good representation of this process if you load the grain into little sacks and lower it from the floor by means of the crane you will see in the picture. As one truck is loaded the train is moved forward to bring the next truck into position, and so on until



the train is ready for departure to the "FORCE" Mills.

A COMPETITION

1st Prize £1 2nd Prize 10/- 3rd Prize 5/-

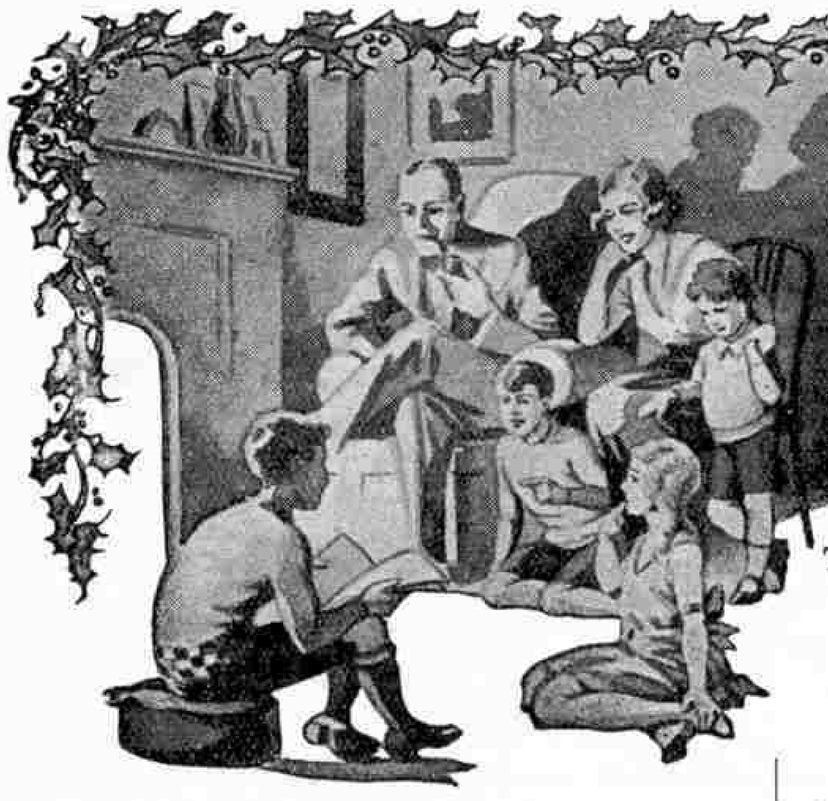
Now that you have all the information necessary to build for yourself a complete model of the whole process of preparing the "FORCE" you have for breakfast every morning, I want you to decide to enter this novel competition. Make yourself a working model demonstrating the whole of the journey of wheat from the wheatlands of Canada via the threshing machine, the grain elevator, the railway, the "FORCE" Mills and the steamer, to your own breakfast table. Make this model so that you can use it either indoors or outdoors, for instance, if you make it in the garden, a plot of grass would represent the wheatlands, a little model of a threshing machine and some cut grass could represent the harvesting. Little carts could be made to carry the grain, which could be represented by gravel, or even real wheat, to the model of the grain elevator, as described on this page. Your model railway could then be laid along the garden path and the train could take the grain to your model of the "FORCE" Mills. Here you could load in the grain at one side, and produce "FORCE" packets on the other. The "FORCE" could next be loaded into another train, and taken to the steamer. If you have a pond and a boat, this part would be easy, but in any case you could mark off a certain area to represent the Atlantic Ocean. Then the "FORCE" packets could again be loaded into the train and taken to towns in England.

What I want you to do is to follow out an idea something like that I have outlined above, and then write me a long letter describing just what you have done. Please remember that, while I should like you to use a model railway, or other useful accessories if you have them, the final result will not depend upon the extent of your equipment, so much as it will depend upon your resourcefulness in devising methods to illustrate the process of turning wheat into "FORCE." The prize winner, for instance, may have only an imaginary train, but the way in which he has planned its working and the way in which he has represented the transference of wheat into "FORCE" might easily be clever enough to win for him the first prize. It is the idea behind your scheme more than the actual practical side of carrying it out that will count most when it comes to judging the entries; although of course, resourcefulness in carrying out the scheme will count too.

Decide now to enter this competition. There will be hosts of consolation prizes as well as the three prizes mentioned above. Build your model, plan its working, and send in your letter with your name and address. Post it so that it reaches me not later than Monday, August 9th, and as much sooner as you like. Mark your envelope MODEL COMPETITION. The result will appear in the September issue of the "Meccano Magazine."

*The parts used in making the model of a Canadian grain elevator illustrated on this page, were as follow:

4	of No.	2	2	of No.	22	1	of No.	94
5	" "	3	1	" "	23A	2	" "	95A
4	" "	8	2	" "	24	2	" "	115
18	" "	9	76	" "	37	1	" "	122
5	" "	9B	2	" "	38	12	" "	131
6	" "	12	1	" "	57B	4	" "	133
2	" "	12B	5	" "	59	1	" "	147
4	" "	14	2	" "	72	1	" "	148
1	" "	18A						



Fireside Fun

WHIZ!

A teacher in a New England school had found great difficulty in training her pupils to pronounce the final "g." One day when a small boy was reading he came to a sentence that he pronounced as follows: "What a good time I am havin'."

"No, Johnny!" said the teacher. "Don't you remember what I told you just the other day? Now read that sentence over again."

Johnny re-read the sentence. "What a good time I am havin'."

"No, no!" said the teacher impatiently. "Remember what I said about the 'g.'"

The boy's face lit up and he read confidently: "Gee, what a good time I am havin'."

* * * *

Two negroes were standing on the corner discussing family trees.

"Yes," said Ambrose, "Ah kin trace mah relations back to a family tree."

"Chase 'em back to a family tree?" said Mose.

"No, man! Trace 'em! Trace 'em! Not chase 'em."

"Well, dey ain't but two kinds of things dat lives in trees—birds and monkeys—and yo' sho' ain't got no feathers on yo'."

* * * *

Teacher: "Now, Willie Smith, tell us where the Rhine flows."

Willie (a true born Cockney): "Dahn the water spaht, o' course, Miss."

* * * *

Waiter: "These are the best oysters we have had for a year."

Customer: "Let's try some you have had for six months."

* * * *

A NATURAL MISTAKE!

There was once a little girl who never could tell the truth. One day she came home from her walk in great excitement. "Mother," she said, "I have just seen a big lion." "You wicked little girl," replied her mother, "You know very well that it was only the yellow dog next door. Go up-stairs at once, kneel down and ask God to forgive you."

The little girl went away and after a few minutes returned. "Well," said her mother, "Did you ask God to forgive you?" "Yes," said the child, "and God said: 'Pray do not mention it, Miss Brown, I have often mistaken that yellow dog for a lion myself!'"

This Month's Short Story

Algy met a bear.
A bear met Algy.
The bear was bulgy;
The bulge was Algy!

* * * *

Travelling Salesman: "I got two good orders in a store to-day."

Friend: "What were they?"

Salesman: "To get out and to stay out!"

CANNIBALISM?

Butcher: "No, mum, I shan't kill myself to-day, but you can have a leg off my brother."

* * * *

Two tramps were looking at a plum tree with open mouths when suddenly a plum fell into the mouth of one of them.

"Lumme," said the other, "you're lucky."

"Ay, but I've got to chew it yet."

* * * *

Teacher: "Horace, you have 2 horses, 3 cows, 6 sheep, 3 hogs, 5 ducks, 8 chickens, and 3 turkeys. Can you add them together?"

Horace: "Yes, Miss."

Teacher: "You can? Well what would you get?"

Horace: "A farm yard."

* * * *

Diner: "What is the matter with this coffee, it looks like mud?"

Waiter: "Well, sir, it was ground this morning."

* * * *

THE AWFUL PROSPECT!

Lizzie Ann: "Brother Congo, I hear Sis Johnson's dead—when she gwine be interned?"

Bro. Congo: "Dey ain't gwine be no internment."

Lizzie Ann: "How come?"

Bro. Congo: "De fambly hab decided she's to be incriminated!"

BIBLICAL HISTORY!

The negro pastor was explaining to his dumbfounded congregation how Pharoah's daughter found Moses in the bulrushes.

"Yas, breddern and sistern, dere was little Moses in dat basket, wid dem wild cattle surroundin' him, an' yellin' an' pawin' de ground.

"But Pharoah's daughter was a brave gal. Forcin' her way through dem ragin' animals, she grabbed up little Moses, an' dat's how she done saved him from de bulrushes."

* * * *

The train was moving slowly, and stopped frequently. At one of these stops an irritated passenger shouted to the guard: "I say, can I get out and pick some flowers?"

"Why, there are none to pick!" was the reply.

"Never mind," said the passenger, "I've got some seeds."

* * * *

A sailor sent a parrot to his mother and on coming home asked her how she liked it: "Very tasty," was the reply "But, by jove, lad, it was tough!"

* * * *

"Good," exclaimed Wilkins, glancing up from his paper, "They have caught the cleverest hotel robber in the country."

"Indeed," said Brown, "Which hotel did he keep?"

* * * *

A party of tourists were climbing to the top of a half-ruined tower, when one of them remarked: "This is a perfect specimen of the spiral staircase."

"Yes," replied the heaviest man of the party, "perspiral, in fact."

* * * *

Teacher: "Who can tell me what 'excavate' means?"

Small Boy: "Please sir, to hollow out."

Teacher: "Right. Now who can make a sentence containing the word 'excavate'?"

Another Small Boy: "Stick a pin in a dog and he will excavate."

* * * *

HE NEARLY WON!

Pat and Mike were working on a high building. Pat bet Mike that he could carry him up to the top of it. Mike bet Pat that he couldn't, so they started up. Fairly good progress was made until they almost reached the top, when suddenly Pat's foot slipped and they almost fell.

"Begorra! I thought I had you then!" cried Mike excitedly.

* * * *

Mother (to Johnny): "Have some more, darling?"

Johnny: "No!"

Mother: "No what?"

Johnny: "No beans."

But he got sufficient to induce him to be polite at table.

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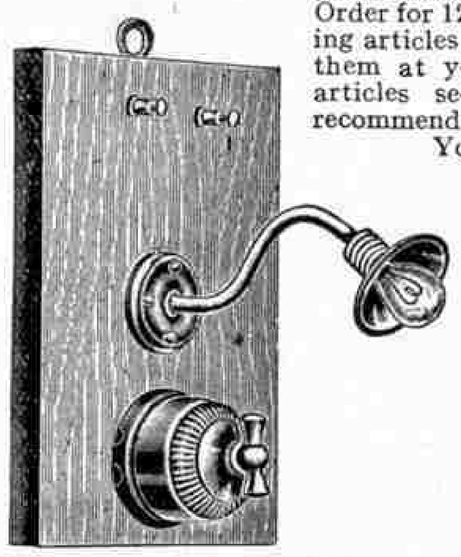

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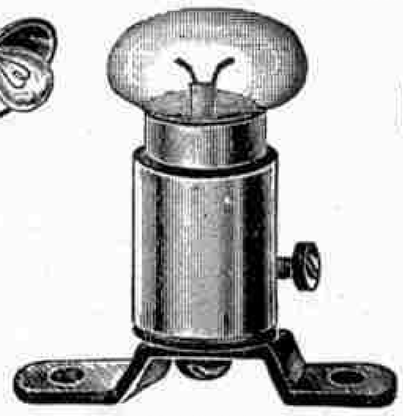

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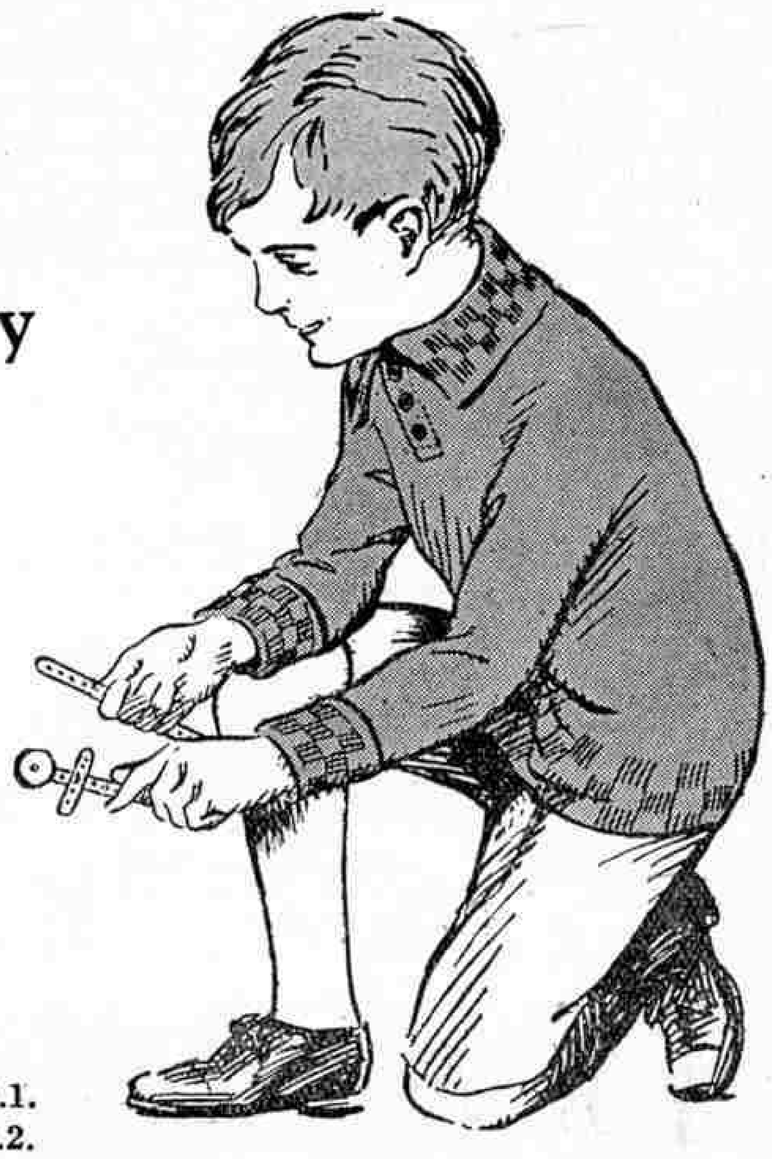

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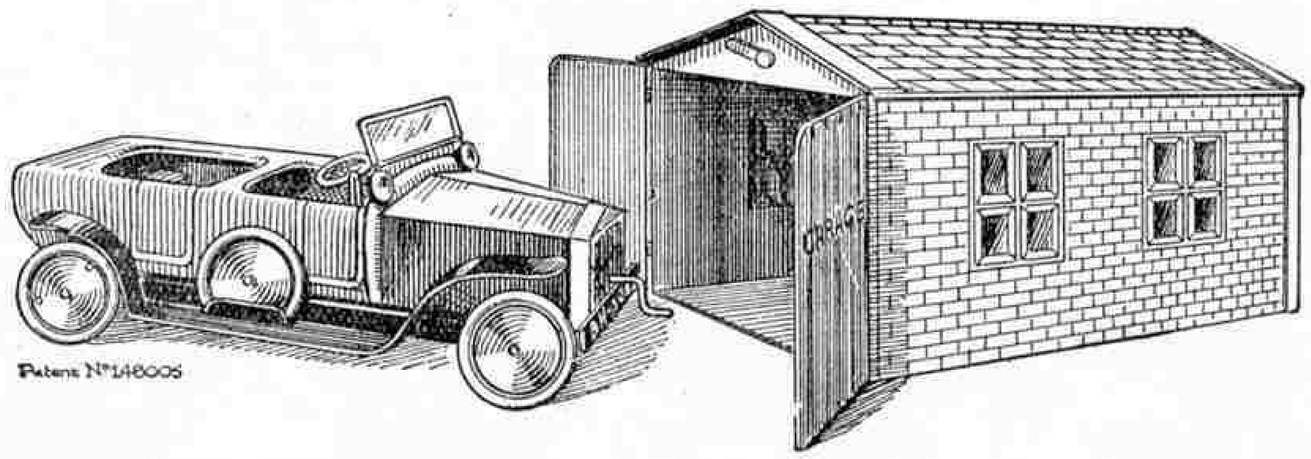

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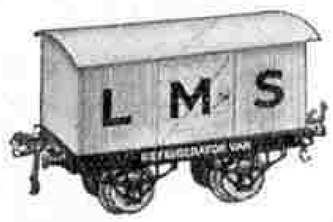
(HORNBY SERIES)

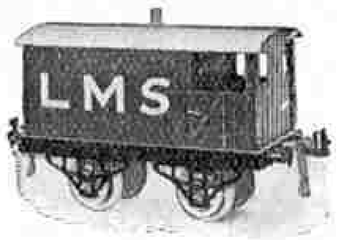
There are now 50 different train accessories—Stations, Signal-boxes, Lamps, Wagons, Level-Crossings, Foot-Bridges, Turntables, etc. Further accessories will be added to the system from time to time, and will be announced in the pages of the "*M.M.*"

All Hornby Rolling Stock and Accessories are built in correct proportion to the size, gauge, method of coupling, etc., of the Hornby Trains and all have the uniformly beautiful finish that is the great feature of the Hornby series. With these accessories you can build up a most realistic railway system, and the splendid range of rails, points, and crossings make possible endless variety in rail layout. Hornby Trains are British made, and your dealer will be able to show you specimens of the new products.

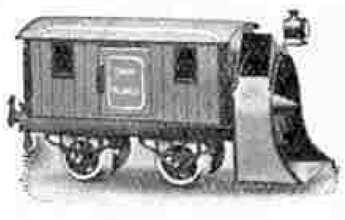
BRAKE VAN
Finished in grey, with opening doors. Price **4/-**



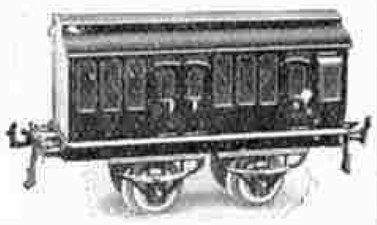
***REFRIGERATOR VAN**
Enamelled in white, with opening doors. Price **4/-**



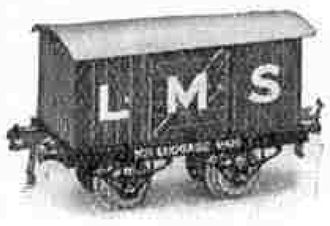
BRAKE VAN
Finished in grey, with opening doors. Price **4/-**



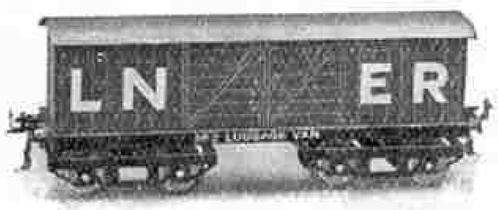
***SNOW PLOUGH**
With revolving plough driven from front axle. Price **5/6**



***GUARD'S VAN**
Realistic design, fitted each side with opening doors. Price **3/6**

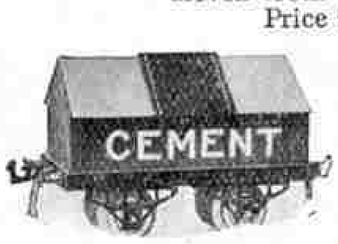


***No. 1 LUGGAGE VAN**
With opening doors. Price **4/-**

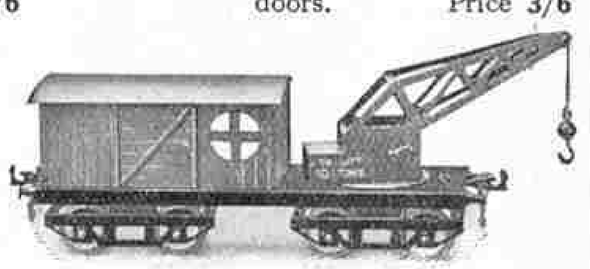


***No. 2 LUGGAGE VAN**
Finished in blue and green. Fitted with double doors. Suitable for 2-ft. radius rails only ... Price **6/6**

***MILK TRAFFIC VAN**
Fitted with sliding door, complete with milk cans. Price **4/6**

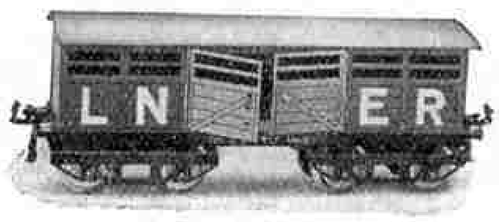


CEMENT WAGON
Finished in grey and black. Price **4/-**

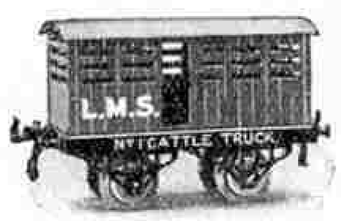


***BREAKDOWN VAN AND CRANE**
Beautifully coloured in grey and black, with opening doors. Suitable for 2-ft. radius rails only ... ... Price **7/-**

SECCOTINE WAGON
Beautifully finished in blue, with opening doors. Price **4/-**



***No. 2 CATTLE TRUCK**
Splendid model fitted with double doors. Suitable for 2-ft radius rails only ... ... Price **6/6**



***No. 1 CATTLE TRUCK**
Fitted with sliding door. Very realistic design. Price **4/-**

SIDE TIPPING WAGON
Excellent design and finish. Price **3/6**

ROTARY TIPPING WAGON
Finished in grey and green. Price **4/-**

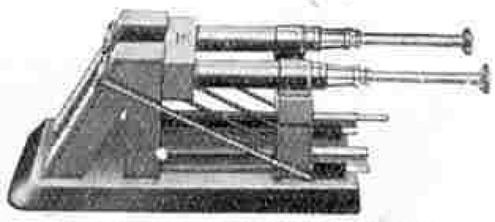
CRAWFORD'S BISCUIT VAN
Finished in red, with opening doors ... Price **4/-**

CARR'S BISCUIT VAN
Finished in dark blue, with opening doors. Price **4/-**

JACOB'S BISCUIT VAN
Finished in crimson lake, with opening doors. Price **4/-**

***GUNPOWDER VAN**
Finished in red, with opening doors. Price **4/-**

***GAS CYLINDER WAGON**
Finished in red, lettered gold. Price **3/-**

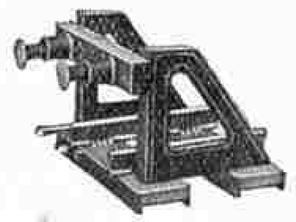


HYDRAULIC BUFFER STOP
Price **5/-**

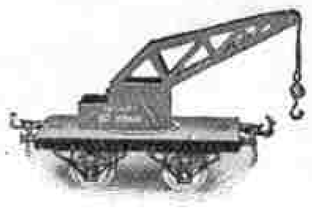
PETROL TANK WAGON "SHELL"
Finished in red. Price **3/-**

PETROL TANK WAGON "PRATTS"
Finished in green. Price **3/-**

MOTOR SPIRIT TANK WAGON "NATIONAL BENZOLE."
Price **3/-**

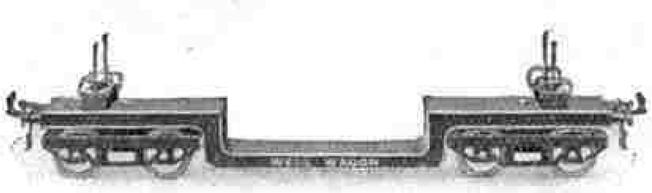


SPRING BUFFER STOP
Price **1/6**

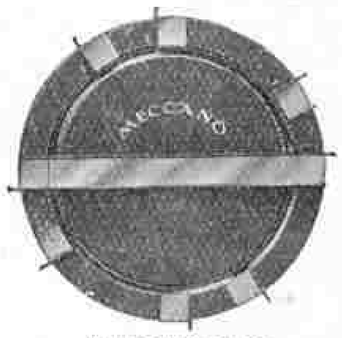


***CRANE TRUCK**
Finished in grey and black ... Price **4/6**

***HOPPER WAGON**
Mechanically unloaded. Finished in grey and black ... Price **4/-**

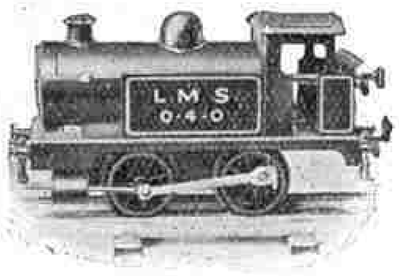


***TROLLEY WAGON**
Finished in grey and red. Suitable for 2 ft. radius rails only ... Price **6/-**

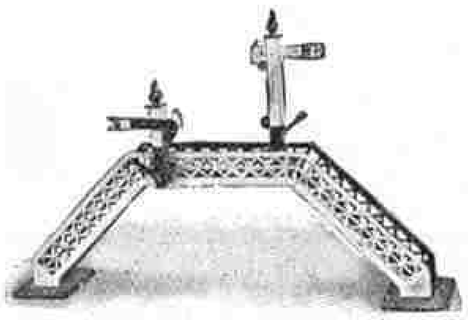


TURNTABLE
Price **5/-**

TUNNEL
Realistic and finished in colours ... Price **7/6**



HORNBY No. 1 TANK LOCO
Gauge 0, in colours to represent L.M.S. or L.N.E.R. Companies' locos. Price **12/6**



FOOTBRIDGE
No. 1. With detachable Signals Price **6/-**
No. 2. Without Signals ... ,, **3/6**
Signals only ... ... per pair **2/9**

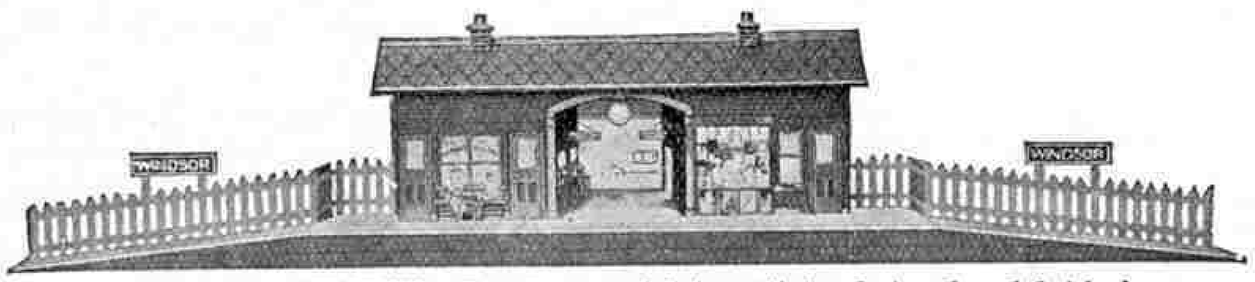
HORNBY No. 2 TANK LOCO
Beautifully finished in colours to represent L.M.S. or L.N.E.R. Companies' locos. Fitted with reversing gear, brake and governor ... ... Price **30/-**

**Lettered L.M.S. or L.N.E.R.*

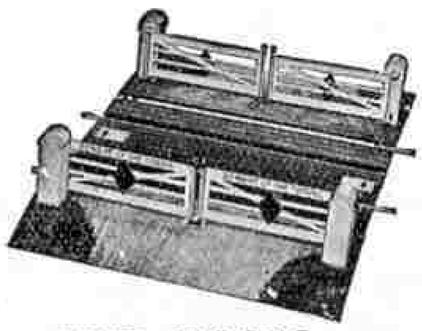
ROLLING STOCK AND ACCESSORIES

(HORNBY SERIES—*continued*)

SIGNAL CABIN
Dimensions: Height 6½-in., Width 3½-in., Length 6½-in. Finished in colour and lettered "Windsor." Roof and back open to allow signal-levers to be fitted inside cabin if desired.
Price **6/6**

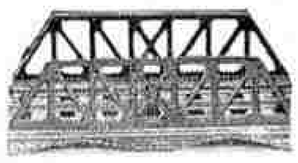


RAILWAY STATION. Excellent model, beautifully designed and finished.
Dimensions Length 2-ft. 9-in., breadth 6-in., height 7-in. Price **12/6**

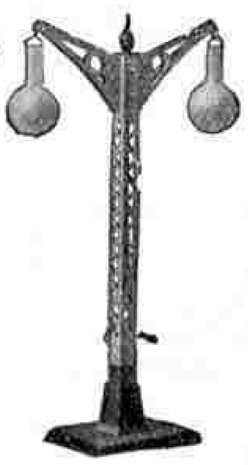


LEVEL CROSSING
Beautifully designed in colour. Measures 11½ × 7½-in. with Gauge 0 rails in position.
Price **6/6**

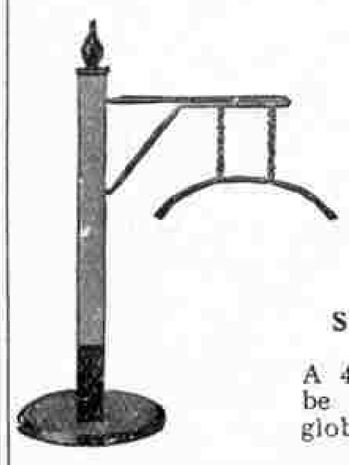
VIADUCT. Price **7/6**
ELECTRICAL VIADUCT. Price **8/-**



VIADUCT (Centre Section on'y) Price **4/6**
ELECTRICAL VIADUCT (Centre Section only) Price **5/-**

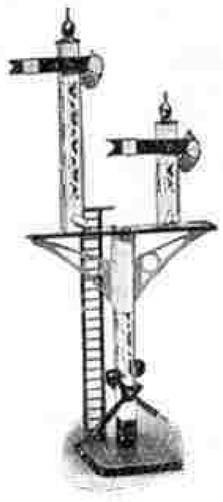


DOUBLE LAMP STANDARD
Four-volt bulbs may be fitted into the globes.
Price **4/-**

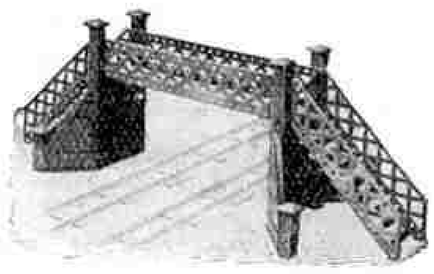


SINGLE LAMP STANDARD
A 4-volt bulb may be fitted into the globe. Price **3/-**

LOADING GAUGE
Price **1/9**

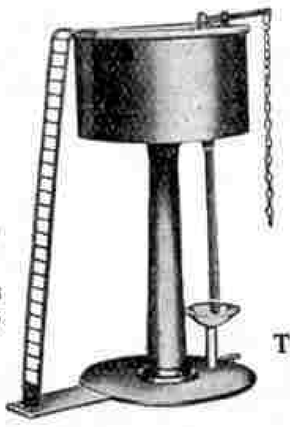


JUNCTION SIGNAL
Signal arms operated by levers at base. Very realistic model standing 14-in. in height.
Price **5/6**



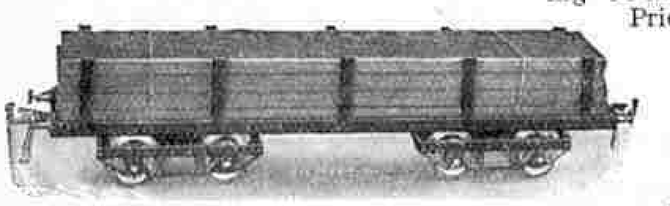
LATTICE GIRDER BRIDGE
Constructional type. Strong and well proportioned.
Price **10/6**

SIGNAL
Price **2/6**

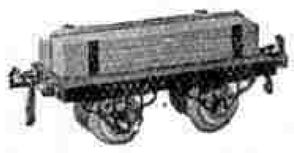


WATER TANK
Brightly coloured in red, yellow and black, 8½-in. in height, with flexible tube and pump lever.
Price **6/6**

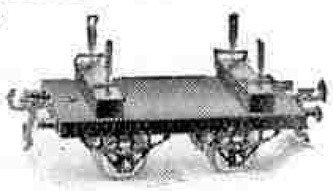
TELEGRAPH POLE
Price **2/6**



***No. 2 TIMBER WAGON**
Beautifully enamelled in green. Suitable for 2-ft. radius rails only ... ... Price **4/6**



No. 1 TIMBER WAGON
Beautifully enamelled in green.
Price **2/-**



***No. 1 LUMBER WAGON**
Fitted with bolsters and stanchions for log transport
Price **2/-**

***No. 2 LUMBER WAGON**
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only.
Price **5/-**

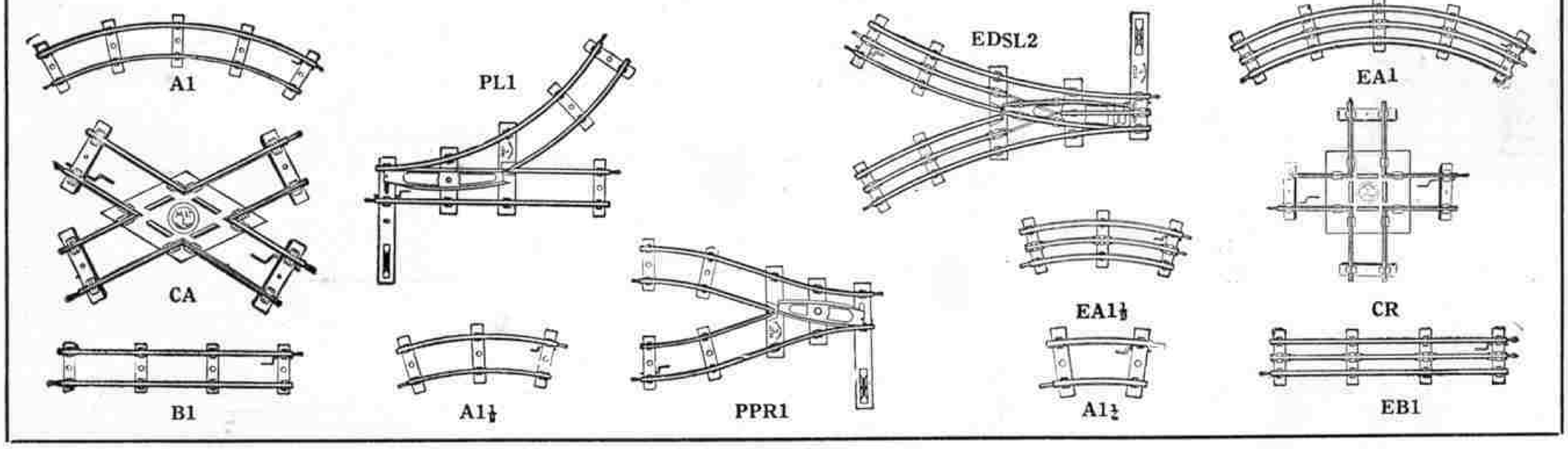
PLATFORM ACCESSORIES
No. 1. Miniature Luggage.
Price per set **2/-**

PLATFORM ACCESSORIES
No. 3. Platform Machines, etc.
Price per set **2/-**

**Lettered L.M.S. or L.N.E.R.*

PLATFORM ACCESSORIES
No. 2. Milk Cans and Truck.
Price per set **2/-**

RAILS, POINTS AND CROSSINGS



Hornby Rails, Points and Crossings are built for hard wear and for smooth running. They are made of the finest materials and hold together rigidly and strongly, for real workmanship is put into them. Note the great superiority both in quality and appearance of the Hornby rails compared with other rails and note also the extra sleepers, giving added strength and steadiness to the track. All Hornby Rails, Points and Crossings are Gauge 0, 1¼", and the Electric rails are fitted with a third rail for collecting shoe.

ASK YOUR DEALER TO SHOW YOU SAMPLES

Meccano & Hornby Train Supplies

All the dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

ACTON'S SPORTS SUPPLY CO.,
ACTON. EALING.
WIMBLEDON. HARLESDEN.

HARRY BROWN,
1, Moss Lane,
ALTRINCHAM.

J. WOODHALL,
256, Grange Road,
Phone : B'head 621 BIRKENHEAD.

MERCER'S DOLLS' HOSPITAL,
68, Darwen Street,
BLACKBURN.

SELLEN'S BAZAAR,
54, Waterloo Road,
BLACKPOOL, S.S.

BROWN, MUFF & CO. LTD.,
BRADFORD.

W. CARTER,
15, Bridge Street,
opp. Mechanics' Institute, BRADFORD.

JOHN TAYLOR,
28, Preston Street,
Tel. : Brighton 957 BRIGHTON.

GYLES BROS. LTD.,
Tel. 2888 24, Bridge Street, BRISTOL.
188, Whiteladies Road, Clifton, BRISTOL.
Tel. 143

JOHN HALL (TOOLS) LTD.,
BRISTOL. NEWPORT.
CARDIFF. SWANSEA.

SALANSON LTD.,
20, High Street, BRISTOL.
4, High Street, CARDIFF.

SAM TAYLOR,
Silver Street,
Tel. 320 BURY.

HAROLD HUNT,
38, Spring Gardens,
Tel. 202 BUXTON.

A. M. HARRIS,
" Wilces Toy Shop,"
14, High Street Arcade, CARDIFF.

H. W. GILL,
23 & 24, Pittville Street,
CHELTENHAM SPA.

R. H. JEPSON,
1, Cross Cheaping,
COVENTRY.

PURSEY & MOCKRIDGE,
The Sports Outfitters,
Tel. Dartford 173 DARTFORD.

HENRY WHALLEY,
195, Duckworth Street,
DARWEN.

RATCLIFFES TOYERIES,
19, Osmaston Road,
DERBY.

C. E. MELLER,
" Dolls' Hospital,"
DONCASTER.

JOHN ARCHIBALD,
20, Woolcomber Street,
DOVER.

DIXON'S,
41, High Street,
DUNDEE.

DRAFFEN & JARVIE LTD.,
Nethergate,
DUNDEE.

CARTER'S STORES,
2, Terminus Buildings,
Tel. 953 EASTBOURNE.

BASSETT-LOWKE LTD.,
1, Frederick Street,
EDINBURGH.

WRIGHT'S DOLLS' HOSPITAL,
14, High Street,
ERDINGTON.

UPTON BROS. LTD.,
Sandgate Rd. and Tontine St.,
FOLKESTONE.

HARRY HUBBARD,
8, High Street,
(Opposite the Cricketers) GILLINGHAM.

ROBERT BALLANTINE,
103½, St. Vincent Street,
GLASGOW.

CLYDE MODEL DOCKYARD,
22-23, Argyll Arcade, GLASGOW.
Model Makers to the Admiralty, the Railway Coys., etc.

POLLOCK & CO., 36, Bridge St. and
222 and 245, Argyle Street
and 39, Paisley Rd. West, GLASGOW.

FLETCHER'S TOYLAND,
77, Deardengate, HASLINGDEN.
Grand Building, RAWTENSTALL.

HAMMOND'S LTD.,
Paragon Square,
HULL.

SMITH & DANIELS,
59, Westgate St., IPSWICH.
25, Market Place, GT. YARMOUTH

PEARSON & DENHAM (PHOTO) LTD., 6, Bond Street,
LEEDS.

ROBOTHAM,
" Baby's Kingdom,"
Tel. 4809 LEICESTER.

LLOYD & SON,
2, Station Street,
LEWES.

BYCROFTS EMPORIUM,
366, High Street,
LINCOLN.

C. LUCAS, Hobbies Depot,
35, Manchester Street,
LIVERPOOL.

Reliance Cycle & Motor Co.,
29/31, Manchester St., Liverpool.
Argyle & Conway Sts., Birkenhead.

THE ARUNDEL CYCLE & MOTOR STORE, 52, Church Road,
Upper Norwood, LONDON, S.E.19.

W. HUMPHRYS & SON,
Estab. in 1840 269/271, Rye Lane,
Peckham, LONDON.

F. R. POTTER & SON,
43, Market Place,
LOUGHBOROUGH.

H. G. PARTRIDGE & CO.,
10, Chapel Street,
Tel. 234 LUTON.

BARR'S CHILDREN'S PARADISE,
49, Deansgate,
Tel. City 165 MANCHESTER.

Meccano & Hornby Train Supplies

The twenty-one dealers whose advertisements appear on this page carry full stocks of Meccano Outfits, Accessory Outfits and Meccano parts, Hornby Trains and Hornby Train Accessories all the year round. The names are arranged in alphabetical order of town.

BAXENDALE & CO. LTD.,
Miller Street,
Tel. 5900 City (20 lines) MANCHESTER.

A. FRANKS LTD.,
95 & 97, Deansgate, MANCHESTER.
90, Bradshawgate, BOLTON.

A. INMAN,
Moorfield Arcade, 105, Lapwing Lane,
Didsbury, MANCHESTER.

JOHN NESBITT LTD.,
42, Market Street,
MANCHESTER.

H. WILES LTD.,
124, Market Street,
MANCHESTER.

SHAW'S BAZAARS,
30-36, High Street,
MARGATE.

R. SCUPHAM & SONS,
35, Linthorpe Road
MIDDLESBROUGH.

DIBBS' DOLLIES' HOSPITAL,
NELSON, LANCS.

ALFREDS, TOY SHOP,
77, Northumberland Street,
NEWCASTLE-ON-TYNE.

WILLIAM OLLIFF,
13, Grainger Street West,
NEWCASTLE-ON-TYNE.

THE OXFORD SPORTS DEPOT,
117, St. Aldates',
OXFORD.

JANES & ADAMS,
13, The Promenade,
And Branches. PALMERS GREEN.

A. J. ROBERTSON,
39-41, Broad Bridge Street,
Tel. 374 PETERBOROUGH.

DEAN & HOLT,
78, Yorkshire Street,
ROCHDALE.

A. J. TINKER,
20, London Road,
SHEFFIELD.

WILSON, GUMPERT & CO. LTD.,
57, Fargate,
Tel. 489 SHEFFIELD.

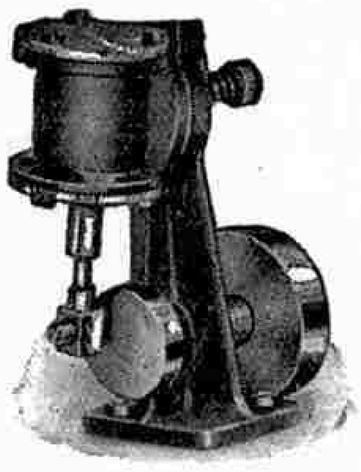
BIRMINGHAM & COVENTRY CYCLE CO., 140 & 151, Above Bar,
SOUTHAMPTON.

OSBORN & CO.,
9, High Street,
SOUTHAMPTON.

S. T. SIMPSON & SON,
589-595, Lord Street,
Tel. 999 SOUTHPORT.

TAYLOR BROS.,
Great Underbank,
Tel. 630 STOCKPORT.

SPORTS HOUSE WOKING & WEYBRIDGE.



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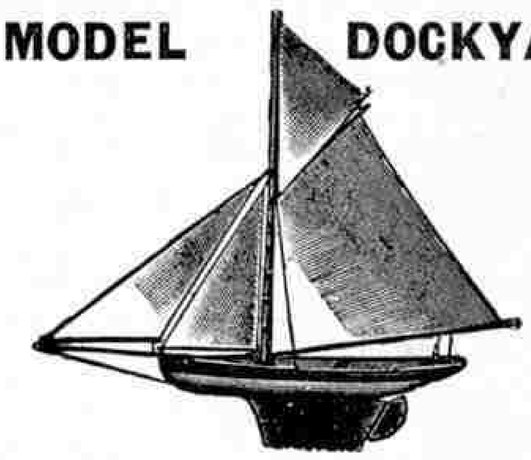

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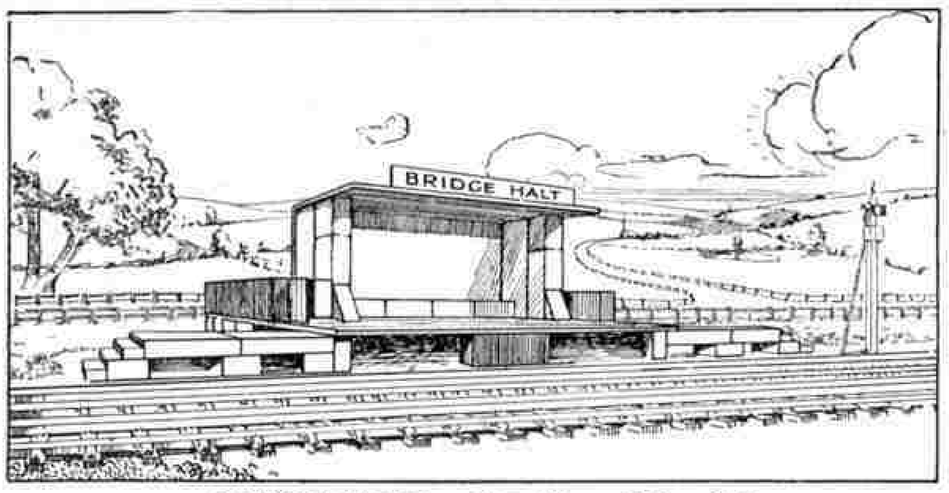

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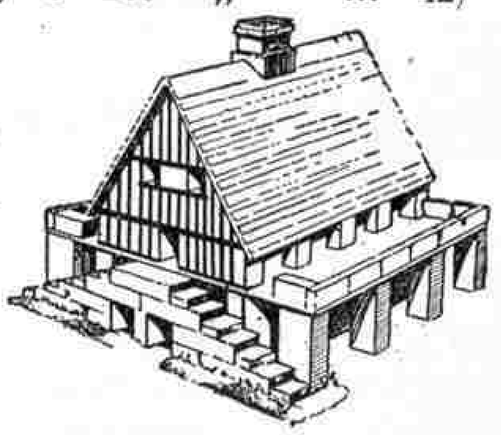

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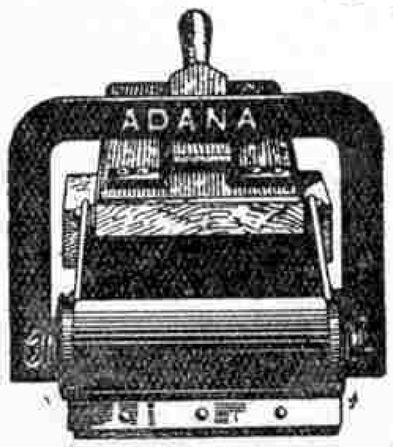

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You can rely on its accuracy.

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Insist upon a genuine **VEEDER**

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Readers' Sales and Wants

If you have anything to sell or wish to buy anything take advantage of the service offered by a small advertisement in these columns.

The "*M.M.*" is read by approximately 100,000 people every month. It circulates in every country where the English language is spoken. If you wish to sell your duplicate stamps, your rabbits, or your tools, or to purchase a loud speaker, a steam engine, a model yacht, or a hundred-and-one other things, you will be able to do so through the columns of the "*M.M.*"

The rates are one penny per word, with a minimum of 1/– (cash with order).

Your advertisement must be received before the 10th of the month for insertion in the following month's issue.

If a Box Number is used, 4d. should be added to cover the cost of postage of the letters to the advertiser from this office. The letters will be posted one week after the advertisement appears, and a second batch a month after the advertisement appears. They will be sent more frequently if additional postage is included with the advertisement.

IMPORTANT.—Advertisements dealing with any article in the Meccano catalogue cannot be accepted.

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Triumph Stamp Album contains 1,500 stamps. Complete, price 16/–. Apply to—H. Thompson, Newtown School, Waterford.

Miss America Launch, splendid condition, 10/–.—Tull, 28, Portland St., Fareham, Hants.

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Send 5 of these coupons with only 2/9 direct to the **Fleet Pen Co., Fleet Street, E.C.4.** You will receive by return a splendid British 14-ct. Gold Nibbed Fleet Fountain Pen value 10/6 (Fine, Medium, or Broad Nib). If only 1 coupon is sent the price is 3/9. 3d. less for each extra coupon up to 4 (Pocket Clip 4d.) Satisfaction guaranteed. Your own name gilt letters, either pen 1/– extra. **Lever Self-Filling Model with Safety Cap, 2/- extra.**

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MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICES:—
BINNS ROAD, LIVERPOOL.
Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 3d. per copy. It will be mailed direct from this office, 2/– for six issues and 4/– for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest; payment will be made for those published. Whilst every care will be taken of those submitted, the Editor does not accept responsibility for any loss or damage. A stamped addressed envelope should be sent where the contribution is to be returned if unacceptable.

Binding Cases. Spring-back Binders to take a number of "*M.M.'s*" are supplied, covered with imitation leather and lettered in gold, price 3/– each (post free).

Meccano Writing Pads. Fifty sheets of tinted bank paper, each printed with Meccano boy at head, 1/– (post free) large size, and 6d. (post free) smaller size.

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Small Advertisements. 1/– per line (average seven words to the line), or 10/– per inch (average 12 lines to the inch). Cash with order.

Display. Quotations for space bookings, and latest circulation figures, will be sent on request.

Press Day, etc. Copy must be received not later than 10th of each month for publication in following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch.

Voucher Copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 4d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Obtaining the "*M.M.*" Overseas

Readers Overseas and in foreign countries may order the *Meccano Magazine* from regular Meccano dealers, or direct from this office. The "*M.M.*" is sold Overseas at 6d. per copy, or mailed (post free) direct from Liverpool, 4/– for six issues, or 8/– for twelve issues.

IMPORTANT.

Overseas readers are reminded that the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms.

CANADA:	Meccano Ltd., 45, Colborne Street, Toronto.
AUSTRALIA:	Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND:	Messrs. Browning, Ifwerson Ltd. P.O. Box 129, Auckland.
SOUTH AFRICA:	Mr. A. E. Harris (P.O. Box 1199) Textile House, Von Brandis St., Johannesburg.

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Lines Bros. Famous Toys

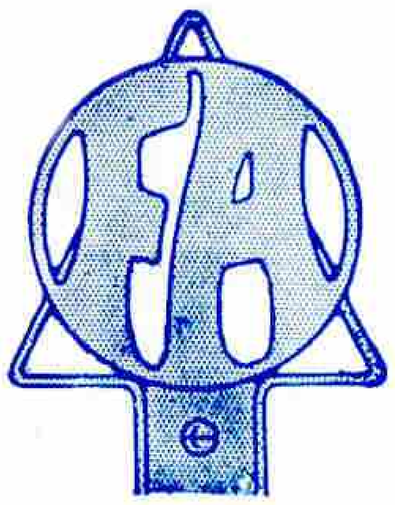
'Look for the Triangle Trade Mark on all these toys.

THEY'RE BRITISH MADE AND WORLD FAMOUS

Lines Bros. Toys are made at the largest Toy Factory in the world by skilled British Craftsmen. Each Toy is well finished and soundly constructed, and the value is the finest the Toy World has ever seen.

For your protection as well as our own, Lines Bros. Toys are marked with the famous Red Triangle Trade Mark. Every toy that bears this Trade Mark is made to give you complete satisfaction, and your children countless months of happiness.

The New Fairycycle Association Badge



The Fairycycle Association

The new Fairycycle Association will appeal very strongly to children everywhere. It has been formed in their interests, and of course, membership, while it is quite free, is confined to all purchasers of the Fairycycle. Full particulars will be gladly sent on application.

The Fairycycle

Regd. Trade Mark

The Fairycycle is a real Cycle—not a make-believe. It is beautifully constructed, and runs ever so easily. It is perfectly safe too.

REDUCED PRICE 39/6

New Model Price 42/-

Similar to Model A but includes new Patent combined Stand and Carrier; a great improvement.

The Pedal Fairykar

Regd. Trade Mark

Here is the very thing for the tiny chap. It is painted a gay, bright red, with nickel-plated handlebar and stem; rubber pedals, etc.

	No. 4a	No. 5a.
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These prices apply only in Great Britain.

Obtainable from all good Toy Shops and Stores.

Sole Manufacturers:

LINES BROS. LTD., 9, Fore Street, LONDON, E.C. 2.

The Comet Motor

This smart little racing model is the very thing for boys and girls of 2½ to 5 years, and will stand plenty of rough wear.

REDUCED PRICE 21/-

SUMMER 1926

GAMAGES

SUMMER 1926

want all "Meccano" Boys to have a Real Good Time

Just you come along to Holborn and see the Wonderful Display of Good Things prepared for you. There's everything for the young Naturalist, Cricket and Tennis Gear, Photography, Cycling, Camping—NOTHING is forgotten.

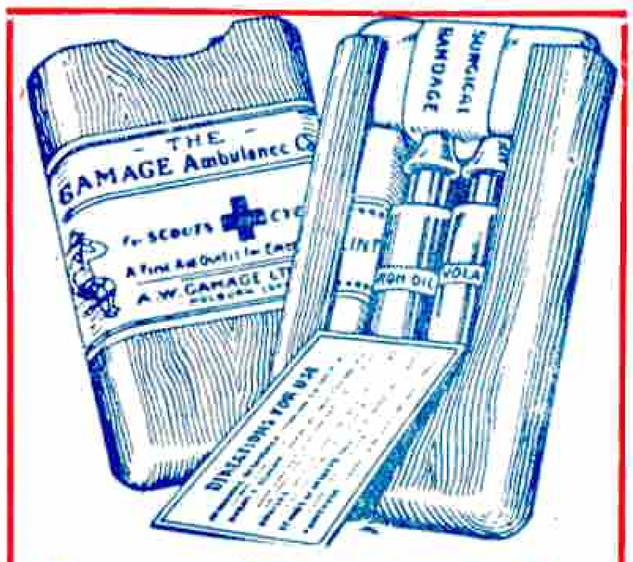
Then there's a fine selection of Hobbies for the wet evenings—Fretwork, Working Models, Meccano, Wireless—a hobby to suit *every* "Meccano" Boy.

If you *cannot* call, just write for one of these Catalogues.

SUMMER SPORTS
SCOUTING & CAMPING
MODEL ENGINEERING

WIRELESS NEEDS
PHOTOGRAPHIC, etc.
CYCLING NEEDS

—Any of which come Post Free to "Meccano Boys."

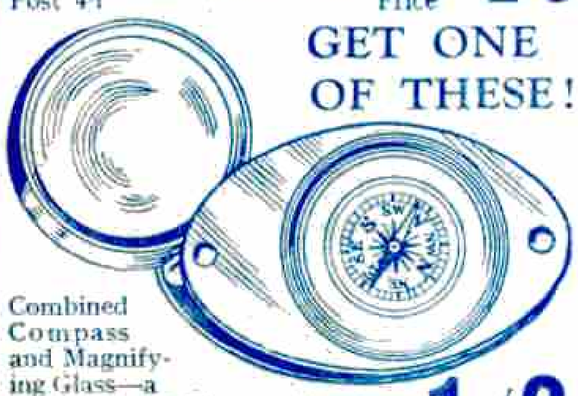


Carry a "First Aid" Case

Always useful for the Pocket or Kit Bag. No. 2. Size 4 ins. × 2¾ ins. × ¾ ins. Contains adhesive Plaster, Boric Lint, Surgical Sponge, Sal Volatile, Tape, Carron Oil, Bandage. Post 4d. Price **1/6**

No. 1. AUTO AID CASE (as illustrated). Size 5½ ins. × 3½ ins. × 1 in. Post 4d Price **2/6**

GET ONE OF THESE!

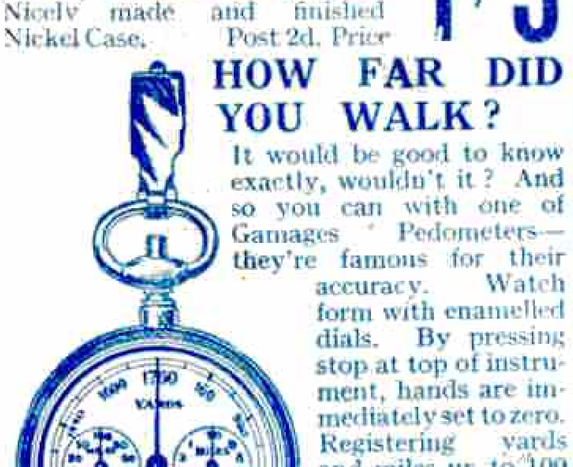


Combined Compass and Magnifying Glass—a very useful little novelty, especially for Scouts and Campers. Nicely made and finished Nickel Case. Post 2d. Price **1/3**

HOW FAR DID YOU WALK?

It would be good to know exactly, wouldn't it? And so you can with one of Gamages Pedometers—they're famous for their accuracy. Watch form with enamelled dials. By pressing stop at top of instrument, hands are immediately set to zero. Registering yards and miles up to 100 miles (3 dials). Price **13/6**

LINE TELEGRAPHY



This Auto-Electric Telegraph Sounder Set consists of two complete stations, which may be used for either receiving or transmitting signals over considerable distances varying with the battery power and length of the line wire used. The batteries provided with the set have sufficient power for transmitting signals over 40 feet of line. Post 6d. Price **13/6**

Get a Walking Stick Telescope!

Comprises 2 lenses for fixing to your stave or walking stick, the smaller one nearer the eye, and the larger one about 14ins. from the smaller. Magnifies up to 5 diameters.

No trouble—no inconvenience in carrying. Post free. Price **3/6**

HORNBY AND MECCANO PARTS

ALL stocked and sent CARRIAGE PAID to any address in the United Kingdom.

GO CAMPING THIS SUMMER!

and get your kit from Gamages!

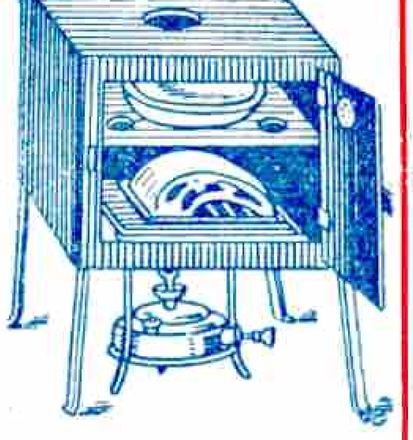
"Kritu" Cookers

Sheet iron, japanned black. Complete with tin, baking pan, grid and shelf, but without stove. Will cook a dinner for several people. Carr. extra. Price **11/6**

Stove Extra.

Oil Stoves

Heavy gauge brass roarer burner. *Boils gal. of water in 10 minutes.* Fine for use with the "Kritu." Car. 1/- **9/6**



CATCH YOUR DINNER AT CAMP!

Easy with this complete Fishing Outfit. Each box contains joint rod, rings and reel fittings. Reel, Lines, Floats, Gut Cast, Ledger, 7 Hooks to Gut, Plummet, Split Shot, Disgorger, Haversack, Worm Bag, Bait, and Book on "How to begin." Price complete **21/-**

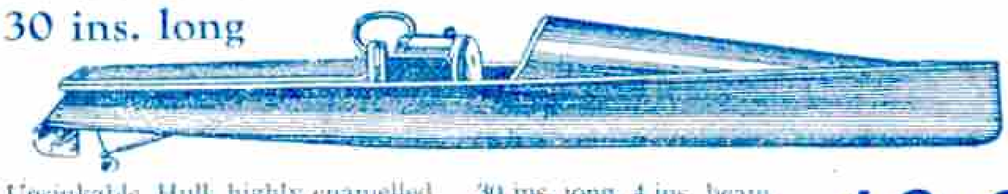
Down in the City.....

Down in the City you'll find our Branch Establishment. You can always see a fine show of Good Things at

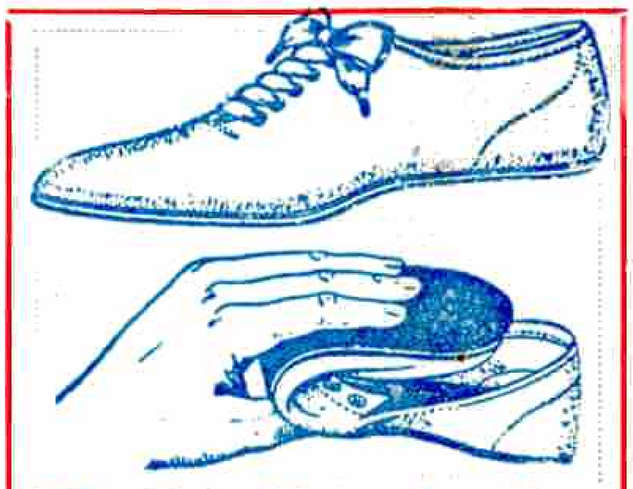
Benetfinks, Cheapside, London, E.C. 2

HERE'S A FINE RACING LAUNCH!

30 ins. long



Unsinkable Hull, highly enamelled. 30 ins. long, 4 ins. beam. Engine—Oscillating type, made of polished brass throughout. Capable of 4,000/5,000 revolutions per minute. Will run for 20 minutes and will travel a mile on the water. Complete with 2-wick Lamp and Filling Funnel. Post 9d. Price **12/6**



The Best Shoes for You

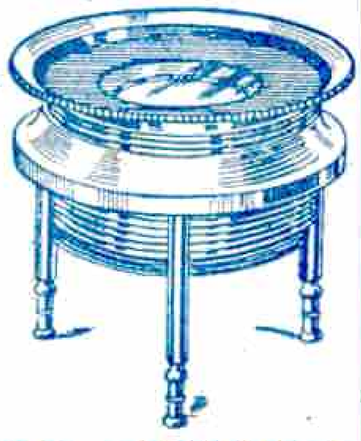
are "Winrubers." They'll stand any amount of wear and rough use and are **guaranteed to outlast 3 pairs of the so-called cheap "plims."** The soles are of leather, impregnated with pure rubber, giving the durability of the former with all the elasticity of the latter—BUT BOTH IN A MUCH GREATER DEGREE. In white, black, brown, or mottled grey canvas. Youths' Sizes 2-5, ... per pr. Men's Sizes **8/11** per pr. Post 6d. **7/4**

Fine 'Snaps' with This!

Here's the "Sevenbob" Camera —a real beauty at the price! Daylight loading, it gives splendid pictures, size 2½ by 1⅝ ins. Easy to carry, weighing only 8 oz. and measuring 2½ by 3½ by 4½ ins. Films per spool of 8, any make 1/2 each. Price **7/-**

Tripod Magnifiers

Extra large Brass Tripod. For the Study of Botany, Pond and Insect Life, etc. Price **3/6** Post free.



BUTTERFLY CABINETS

CORKED and PAPERED

Drawers	Height	Width	Depth	Price
4	13 ins.	12 ins.	8 ins.	25/6
6	15 ins.	16½ ins.	9 ins.	35/-
8	18 ins.	22 ins.	11 ins.	63/-
10	19½ ins.	27½ ins.	12 ins.	90/-

Carr. extra. Crates (returnable) charged 2/-

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